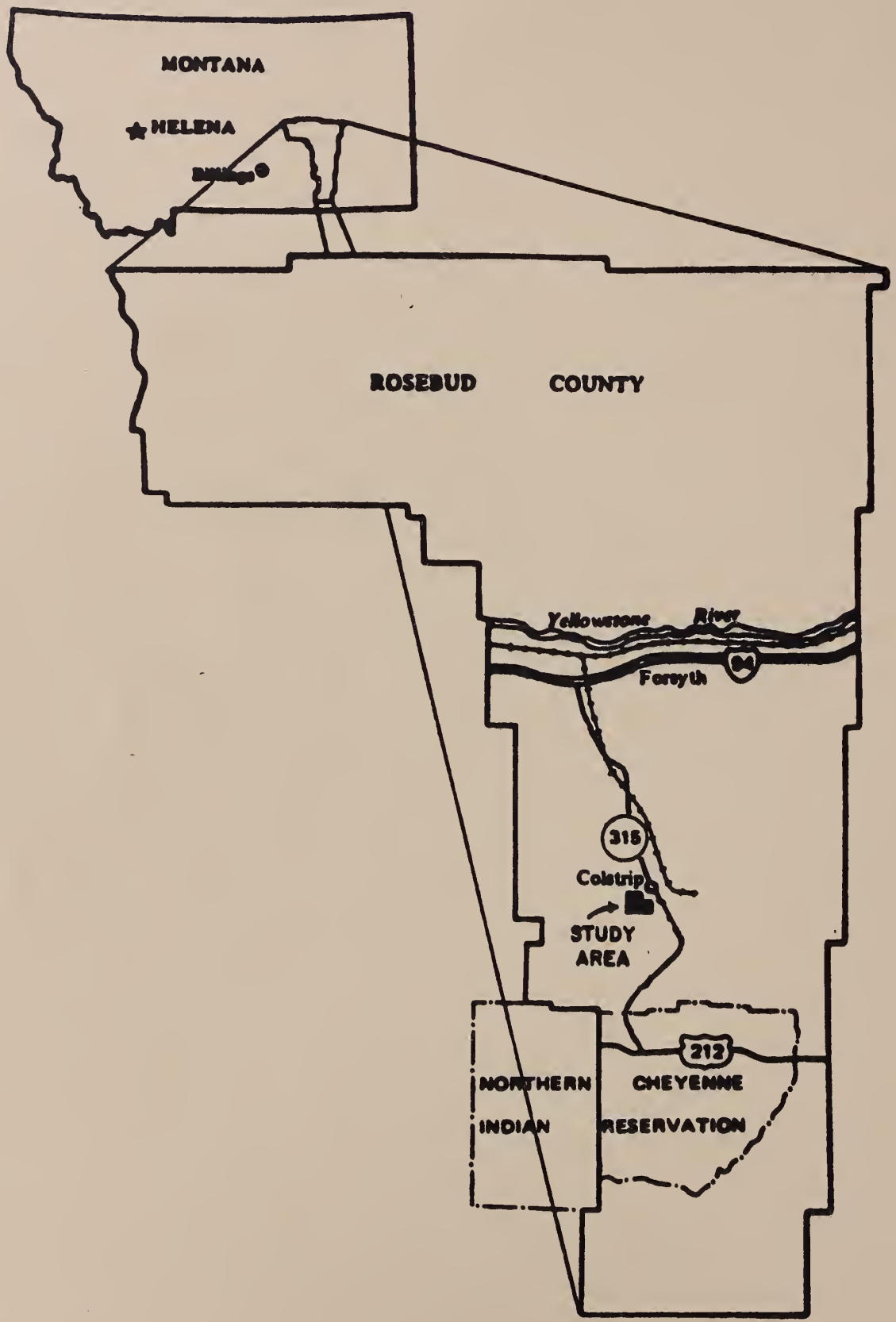
DRAFT

Environmental Impact Statement

Western Energy Company's Rosebud Mine
Area B Extension



Draft Environmental Impact Statement

Western Energy Company's Rosebud Mine, Area B Extension

Prepared by the Montana Department of State Lands

Pursuant to the Montana Environmental Policy Act

February, 1980

Leo Berry, Jr., Commissioner
Montana Department of State Lands

SUMMARY

(x) Draft ( ) Final Environmental Impact Statement

Montana Department of State Lands

Action being considered:

This document describes the environmental impacts that would result from approval of Western Energy Company's (WECO's) proposed amendment of the mining and reclamation plan for Area B of its Rosebud mine near Colstrip, Montana. WECO's Area B mine has disturbed 320 acres since 1976 under the provisions of permit #76003-A002. WECO proposes to disturb an additional 1,083 acres over an 11 year period within a proposed 1366 acre permit amendment area. The mine would produce about 3 million tons of coal annually through 1990.

The Commissioner of State Lands must decide whether to (1) approve the permit amendment or portions of the amendment as proposed, (2) approve the permit with stipulations, or (3) deny the amendment or portions of the amendment.

Summary of impacts:

Impacts on the human environment from the proposed mine would generally not be significant; however, impacts on geomorphology, soils, and vegetation would be significant because the company's mine plan would not minimize avoidable erosion and maximize vegetative growth. The Commissioner could impose or formally suggest several mitigating measures that would reduce those impacts. A summary of impacts by resource follows. For detailed discussion of impacts see chapter III; for discussion of possible mitigating measures see chapter IV, Technical Alternatives.

- Geology--the proposed mine plan would not minimize avoidable erosion. Alternative postmining management could prevent adverse amounts of trace elements, clay, and salt from hindering vegetative growth.

- Hydrology--minimal sediment would be added to East Fork Armells Creek; ground water quality, although degraded, would be in the normal range for undisturbed areas near Colstrip; ground water quantity would not be noticeably affected.

- Climate--no detectable impacts are expected.

- Air quality--the mine would continue to contribute slightly to the already reduced air quality in the Colstrip "nonattainment area." Local residents and mine workers would occasionally be exposed to potentially hazardous concentrations of particulate. These impacts could be mitigated.

- Soils and vegetation--reclaimed soils on about 225 acres could limit vegetative growth. The reclaimed land would require more sensitive management than undisturbed land.

- Wildlife--habitat that is more suitable is available nearby for the few game species that would be disturbed. No rare, threatened, or endangered species use the mine area.

- Social and economic conditions--Area B would not appreciably increase employment or population in Rosebud County. Adverse impacts from construction of Colstrip generating units 3 and 4 will far outweigh the impact of Area B. The expansion of community services and facilities in Forsyth and Colstrip needed to accommodate the influx of workers for the generating units will also accommodate the small population increase attributable to Area B.

- Land use--the mine would not appreciably affect the existing land use pattern in Rosebud County. About 1,366 acres would be removed from livestock grazing during mine life.

- Transportation--traffic from the population associated with the mine would not exceed highway capacity, and coal shipments by unit train would not exceed rail capacity.

- Recreation--the mine area is privately owned and only occasionally used for outdoor recreation, and similar undisturbed areas are available nearby. The mine would continue to contribute slightly to the already strained recreation facilities in the Colstrip area.

- Cultural resources--the mine area appears to contain no archeological or historical sites of importance.

- Esthetics--existing sights and sounds of the mine would continue, but no lands of unusual scenic importance would be disturbed.

Short Term Uses Versus Long Term Productivity:

Coal from the Area B extension would be burned in the Midwest to generate electric power. WECO would pay a total of about $83 million in taxes and royalties. The taxes would help finance schools, both in Rosebud County and the State, and would also be used for other State, local, and Federal government expenses. These benefits would mostly be short term, although $660,000 of the total would be added to the State resource indemnity trust fund, and $20 million would accrue to the permanent trust fund established by the Montana Constitution.

If the mine area were not disturbed, it would continue to provide livestock forage, water (primarily for local agricultural uses), wildlife habitat, scenery, and limited recreation opportunities. None of these uses is notable at present. The minesite has been heavily grazed in anticipation of mining, and following reclamation vegetative productivity may increase over the current level. The minesite's value as undisturbed watershed is perhaps most important, but following reclamation there would be little change in its current hydrologic function. Use by wildlife is limited at present and would not be greatly changed by mining. The minesite is of little importance for recreation and scenery.

Irreversible and Irretrievable Commitments of Resources

The Area B mine extension would remove about 32 million tons of coal through 1990. An additional 2 million tons of coal would not be recovered and would probably be lost to future mining. The coal mined would be about 1/10 of 1 percent of the estimated strippable coal reserves in southeastern Montana.

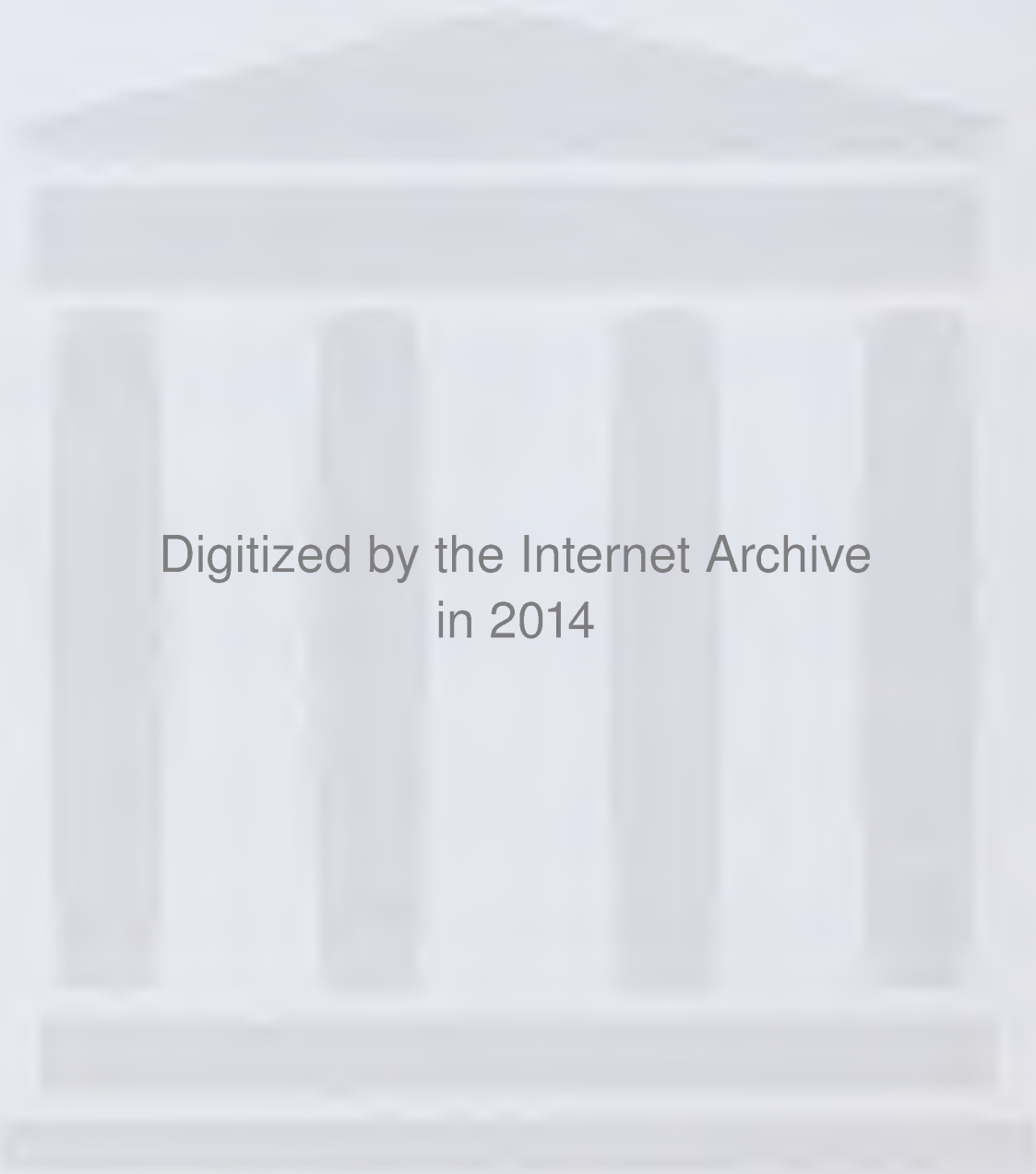
At an average annual coal production rate of 3 million tons, about 2.5 million gallons of diesel fuel and 14 million kilowatt-hours of electricity would be used at the mine each year. Total direct energy used to mine and ship the coal to Midwest markets would amount to about 7 percent of the energy equivalent of the coal. Indirect energy consumption (such as the energy needed to manufacture the heavy equipment) is not known.

About 100 acre-feet/year of water would be consumed at the mine; about 10 acre-feet/year would be consumed by that portion of the population of Colstrip and Forsyth associated with the mine. This continued use would not conflict with existing water rights or uses.

The existing topography and stratigraphy would be permanently altered. This is of little consequence because the topography and stratigraphy is not unusual or intrinsically valuable. The primary effect of topographic changes would be an esthetic loss and increased erosion along the reduced highwall. Mixing of the stratigraphy and soil horizons would adversely affect hydrologic conditions and plant growth, but the effect would not be severe.

Based on past experience at strip mines in the region, about 25 worker-days would be lost from accidents through 1990. There have been no fatal accidents at the mine to date.

A relatively minor amount of livestock forage would not be available during mining and initial reclamation.



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CHAPTER I

DESCRIPTION OF THE PROPOSAL UNDER CONSIDERATION

A. SCOPE OF THE ANALYSIS

Western Energy Company (WECO) has applied for State and Federal permits to expand Area B of its Rosebud mine near Colstrip, Montana, into sections 4, 5, 9, 10, and 11, T. 1 N., R. 41 E. (See inside front cover and figure I-1.) The company proposes to bond 1,366 acres for mining level disturbance, 1,083 acres of which would be mined through 1990. The area to be mined is entirely within sections 4, 9, and 10 and is the focus of this EIS. The remaining 283 acres bonded for mining level disturbance but not mined would be used for haul roads, topsoil and spoil stockpiles, and a highwall reduction area.

Of the 1,366 acres included in the permit application, 711 acres have been previously permitted by the Montana Department of State Lands for use as haul roads and other disturbance associated with mining. WECO's proposed permit amendment would allow them to mine part of the 711 acres. The remaining 655 acres are part of WECO's leasehold but are not now permitted for disturbance. Coal production from Area B is not expected to increase above the 3.7 million tons mined in 1977. (See table I-1).

The mining and reclamation plan (hereinafter termed "mine plan") submitted by WECO must be approved by the Department of State Lands under the Montana Strip and Underground Mine Reclamation Act of 1973, as amended. WECO has State and Federal permits for its current mining operations in section 3, T. 1 N., R. 41 E. If WECO's mine plan proves acceptable, the Department would amend the company's existing permit. The Office of Surface Mining (OSM), U.S. Department of the Interior, must also approve the proposed mine plan under the Surface Mining Control and Reclamation Act of 1977, but Federal approval is not specifically considered in this EIS.

Because the proposed expansion may significantly affect the quality of the human environment, the pending State decision on the mining permit amendment requires an environmental impact statement (EIS). This draft environmental impact statement (DEIS) reviews the company's proposal, assesses its probable impacts, and evaluates reasonable alternatives to the company's proposal.

The DEIS is divided into five main chapters and a summary. This chapter describes the company's proposal. Chapter II examines the existing environment and provides an overview of all resources applicable to the mine area. Chapter III assesses the impacts that would probably result from the company's proposal. Chapter IV outlines administrative and technical alternatives to the proposed mine plan that are available to the Department, and suggests other measures to mitigate environmental impacts. The summary briefly describes the company's proposal and its expected environmental impacts.

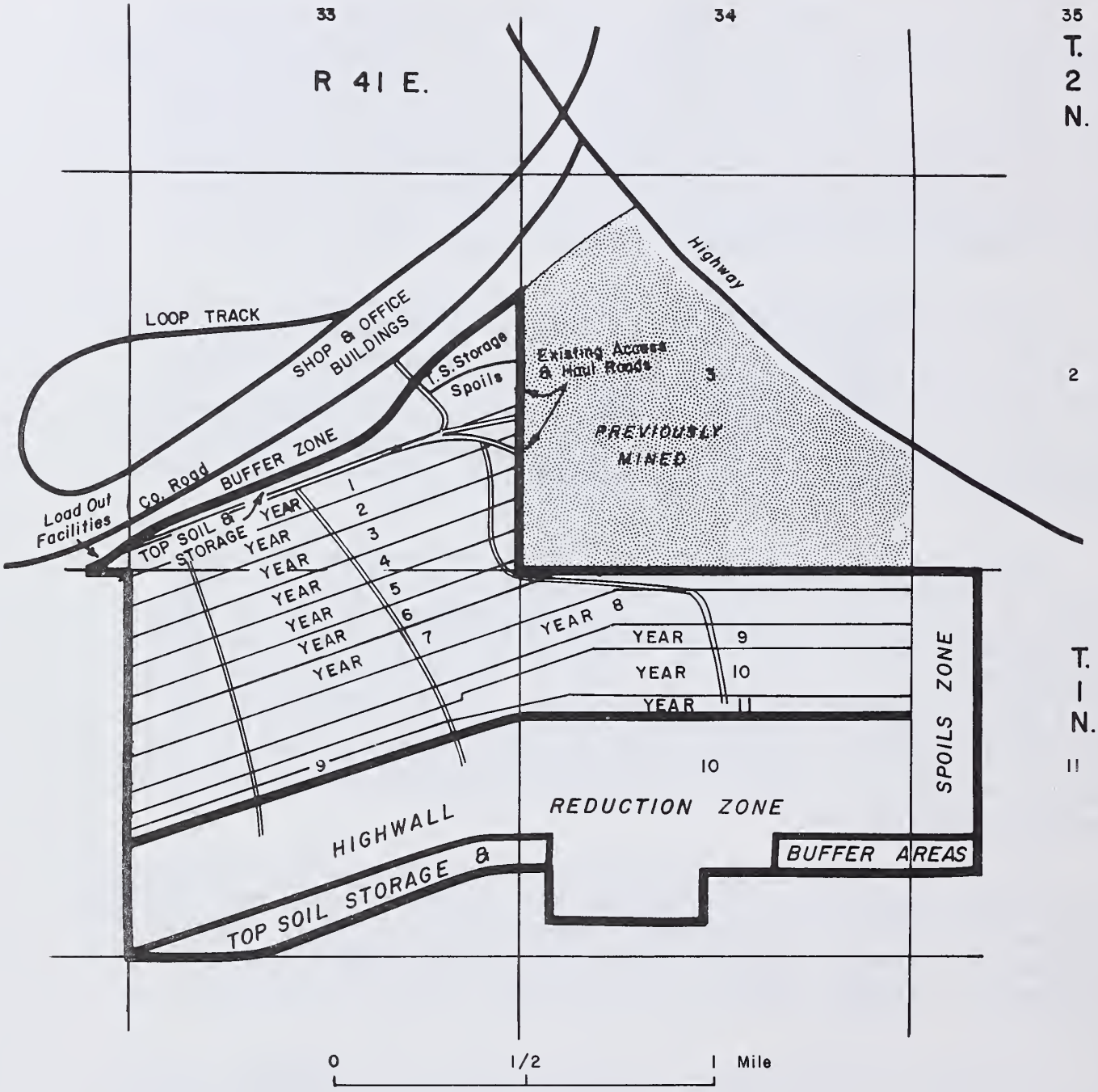

FIGURE I-1.--Sequence of mining at Area B.

TABLE I-1.--Annual production from Colstrip-area mines (millions of tons)

Year	Western Energy Co. Area B*	Western Energy Co. Total	Peabody Big Sky	Total
1975	0.0	6.4	2.2	8.6
1976	0.7	9.3	2.4	11.7
1977	3.7	9.8	2.3	12.1
1978	2.3	10.6	2.1	12.7
1979	1.6	11.4	2.3	13.7
1980	2.1	11.4	3.0	14.4
1981	3.5	12.3	4.2	16.5
1982	3.5	13.2	4.2	17.4
1983	3.5	14.3	4.2	18.5
1984	3.5	17.1	4.2	21.3
1985	3.1	19.1	4.2	23.3
1986	3.0	19.1	4.2	23.3
1987	3.4	19.1	4.2	23.3
1988	2.8	19.1	4.2	23.3
1989	2.9	19.1	4.2	23.3
1990	1.0	19.1	4.2	23.3

*Sections 3, 4, 9, and 10.

B. PREVIOUS EIS'S ON AREA B

In 1976 the Department of State Lands prepared an EIS on the expansion of WECO's Rosebud mine into Area B (sec. 3, T. 1 N., R. 41 E.). This document supplements the 1976 EIS and focuses on the extension of the Area B mine into sections 4, 9, and 10. The Rosebud mine was also discussed in in FES 80-1, a regional analysis of coal development in the northern Powder River basin (U.S. Department of the Interior and Montana Department of State Lands, 1980). FES 80-1 provides an overview of cumulative impacts from mining and electric power generation in the Colstrip area, to which Area B of the Rosebud mine contributes. Pertinent portions of both previous EIS's are used as references in this document.

This EIS evaluates impacts from the Area B extension in the context of other ongoing and projected coal-related development in southeastern Montana. For example, impacts on social conditions due to Area B would be influenced by the influx of construction workers for Colstrip generating units 3 and 4. The analysis of social and fiscal conditions, air

quality, and transportation depends heavily on the context of coal development surrounding Area B. The analysis of impacts on hydrology, wildlife, and esthetics depends to a lesser extent on concurrent development; the analysis of impacts on geology, soils, and cultural resources is dependent to a minor extent. For additional cumulative analysis see FES 80-1.

Other developments considered in this EIS include:

- The remainder of the planned WECO Rosebud mine. (See table I-1.)
- Montana Power Company's Colstrip generating units 1 and 2 (in operation), and generating units 3 and 4 (under construction). Total coal consumed by these units will be 6.1 million tons/year (mty) by 1986.
- Peabody Coal Company's Big Sky mine south of Colstrip, which is projected to produce 4.2 mty by 1985.
- Westmoreland Resources, Inc.'s Absaloka mine near Hardin, which is projected to produce 10 mty by 1985.

Mines near Decker in southern Big Horn County would not appreciably affect the Colstrip area and are not discussed in this EIS.

C. WESTERN ENERGY COMPANY'S PROPOSAL

1. Summary

WECO's Area B mine is in southwestern Rosebud County, Montana, about 1 mile south of the town of Colstrip. Coal from Area B is hauled about 1 mile to the coal handling facilities at Area A north of East Fork Armells Creek. Coal from both Area A and Area B is loaded onto unit trains and shipped to meet WECO's long term contracts with utility customers in the upper Midwest. (See table I-2.) The bulk of the coal is burned to generate electric power. Smaller amounts (about 300,000 tons/year) are directly used for space and process heat.

TABLE I-2.--Current and projected coal sales from WECO Areas A and B (thousands of tons)

Utility/Generating Station	1978	1979	1980	1985
Northern States Power/Sherburne 1&2 (Minn.)	5,500	5,577	5,500	5,000
Wisconsin Power & Light/Columbia (Wisc.)	1,900	1,914	1,900	3,600
Upper Peninsula Generating/Marquette (Mich.)	171	300	300	-
Great Lakes Coal/various (St. Paul, Minn.)	600	300	300	300
Lake Superior Dist. Power/Bayfront (Wisc.)	90	120	200	270

Of the 1,366 surface acres under consideration in this permit amendment application, 1,116 acres are leased to WECO by Burlington Northern, Inc., while 250 acres are owned by WECO. (See fig. I-2.) WECO has requested bonding at mining level standards for the entire 1,366 acres so it can modify the location of haul roads without having to receive new permits. WECO obtained the Federal coal leases for section 4 in 1966 (lease #020989-038770) and for section 10 in 1979 (lease #M-35734). The company obtained the private coal leases in section 9 in 1959 from the Northern Pacific Railroad, now Burlington Northern, Inc. (See fig. I-3.)

The proposed mine area contains 32.3 million tons of economically recoverable coal. Those reserves would be mined through 1990 at an average annual rate of 2.9 million tons/year. Past and projected coal production from Area B and the Rosebud mine is shown in table I-1.

Of the 10 coal seams in the area, WECO plans to mine only the uppermost seam, the Rosebud. The Rosebud averages 18-26 feet in thickness, is subbituminous (8420-8870 BTU's/pound), and contains about 1.1 percent sulfur by weight. The Rosebud seam is covered by an average of about 120 feet of overburden. The overburden is shallowest (under 50 feet thick in places) near East Fork Armells Creek where WECO plans to begin mining, and is over 200 feet thick in areas of higher relief in sections 9 and 10.

The McKay seam is 10-100 feet below the Rosebud. WECO has not found a suitable market for the McKay seam because of the coal's tendency to slag at normal boiler operating temperatures. WECO therefore does not plan to mine the seam.

2. Facilities

WECO does not propose to build new facilities for the Area B extension (fig. I-4). Existing facilities (fig. I-4) include:

- A 0.8-mile access road to highway FAP 39.
- A 3.8-mile railroad spur and loop track in Area A.
- Several steel-framed structures, an office, a maintenance shop, change rooms and bath facilities, storage buildings, and a heavy-equipment wash facility.
- Fuel and explosive storage tanks.
- Coal-handling facilities at Area A: primary and secondary crushers, coal storage pile, tipple loadout with weighing and sampling stations, and a unit train loadout.
- Water supply (from Colstrip), a three-cell lagoon for domestic waste, and impoundments to collect water for dust suppression.

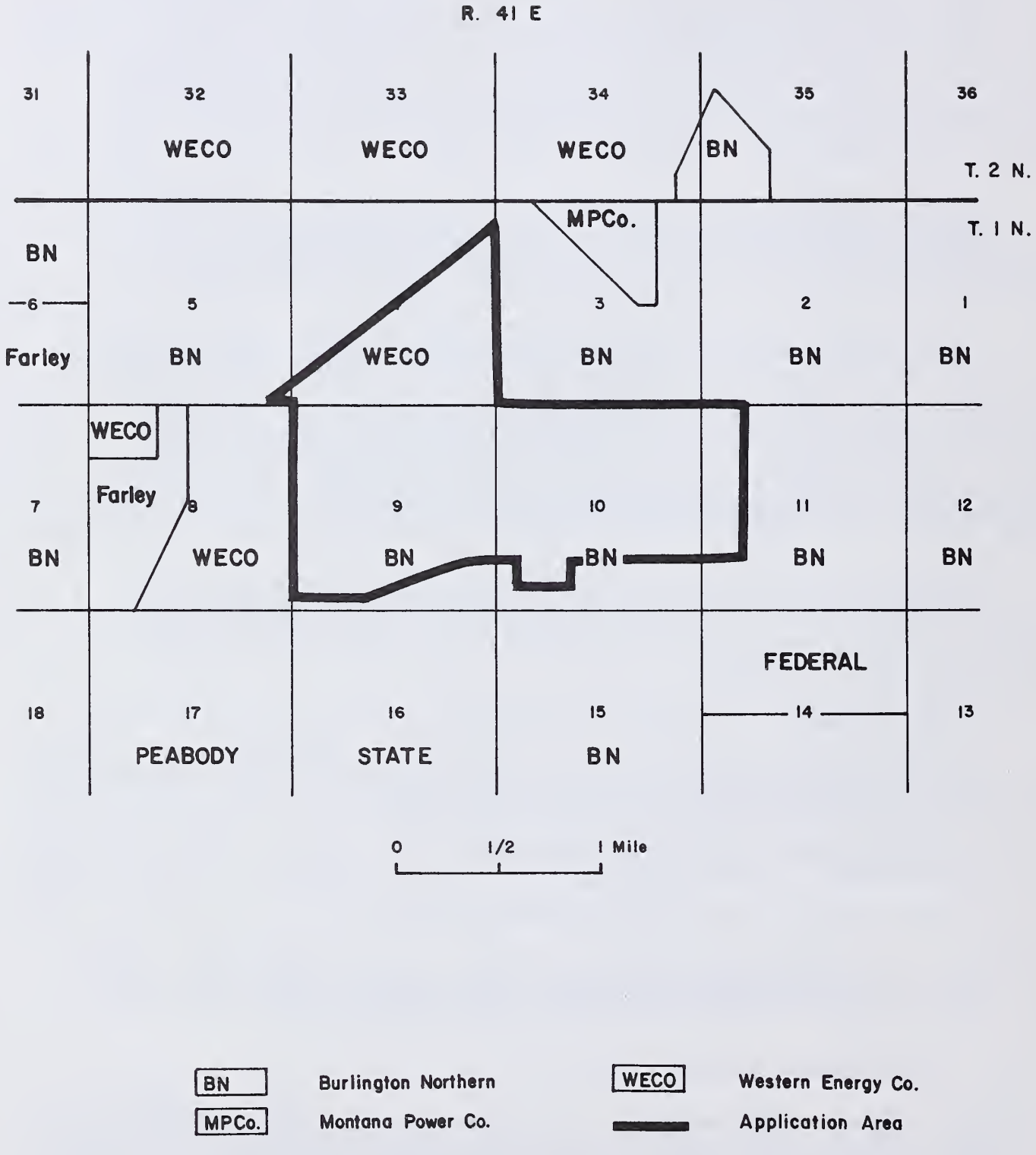

FIGURE I-2.--Surface ownership at Area B.

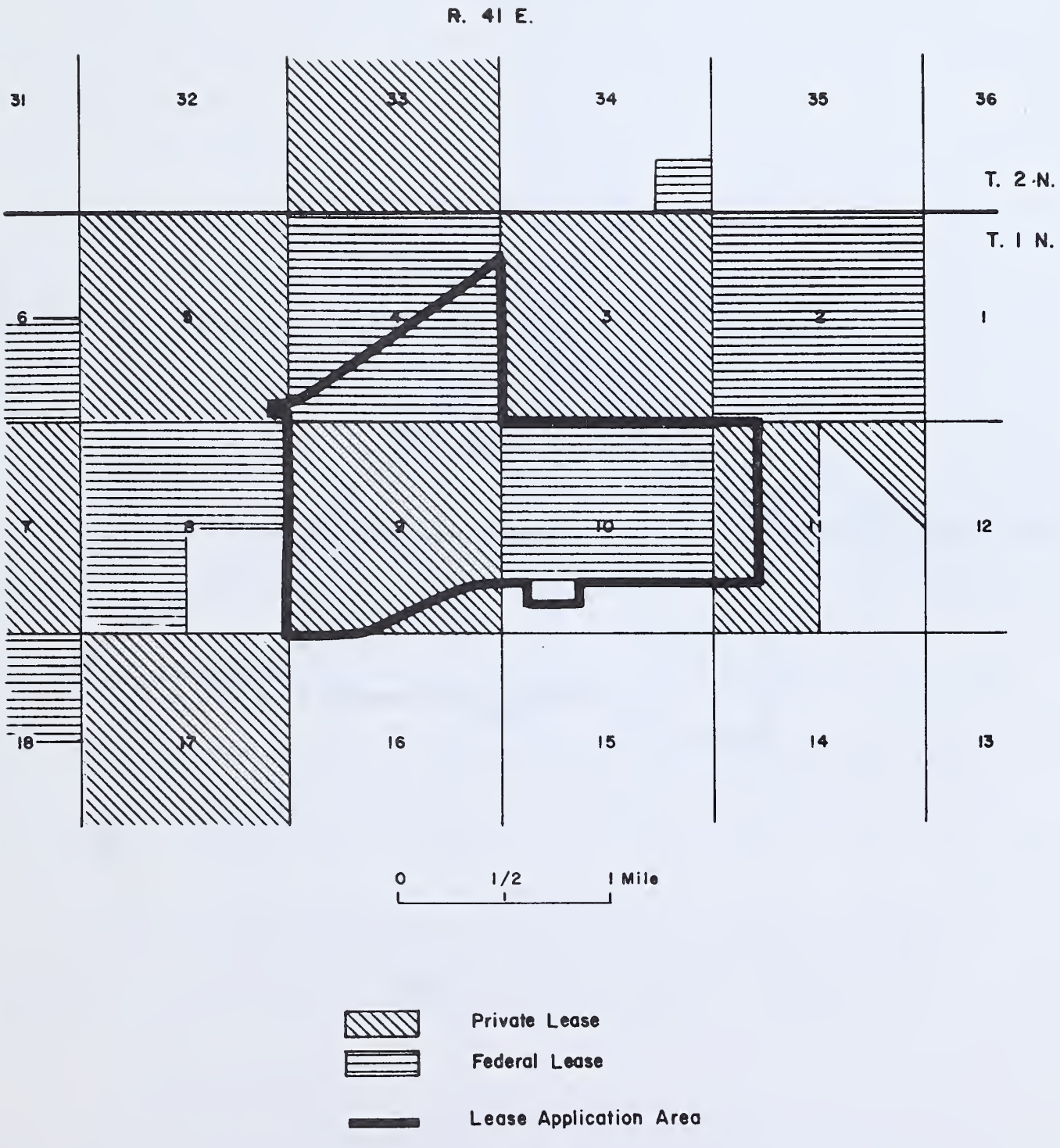

FIGURE I-3.--Coal leases held by Western Energy Co. at Area B.

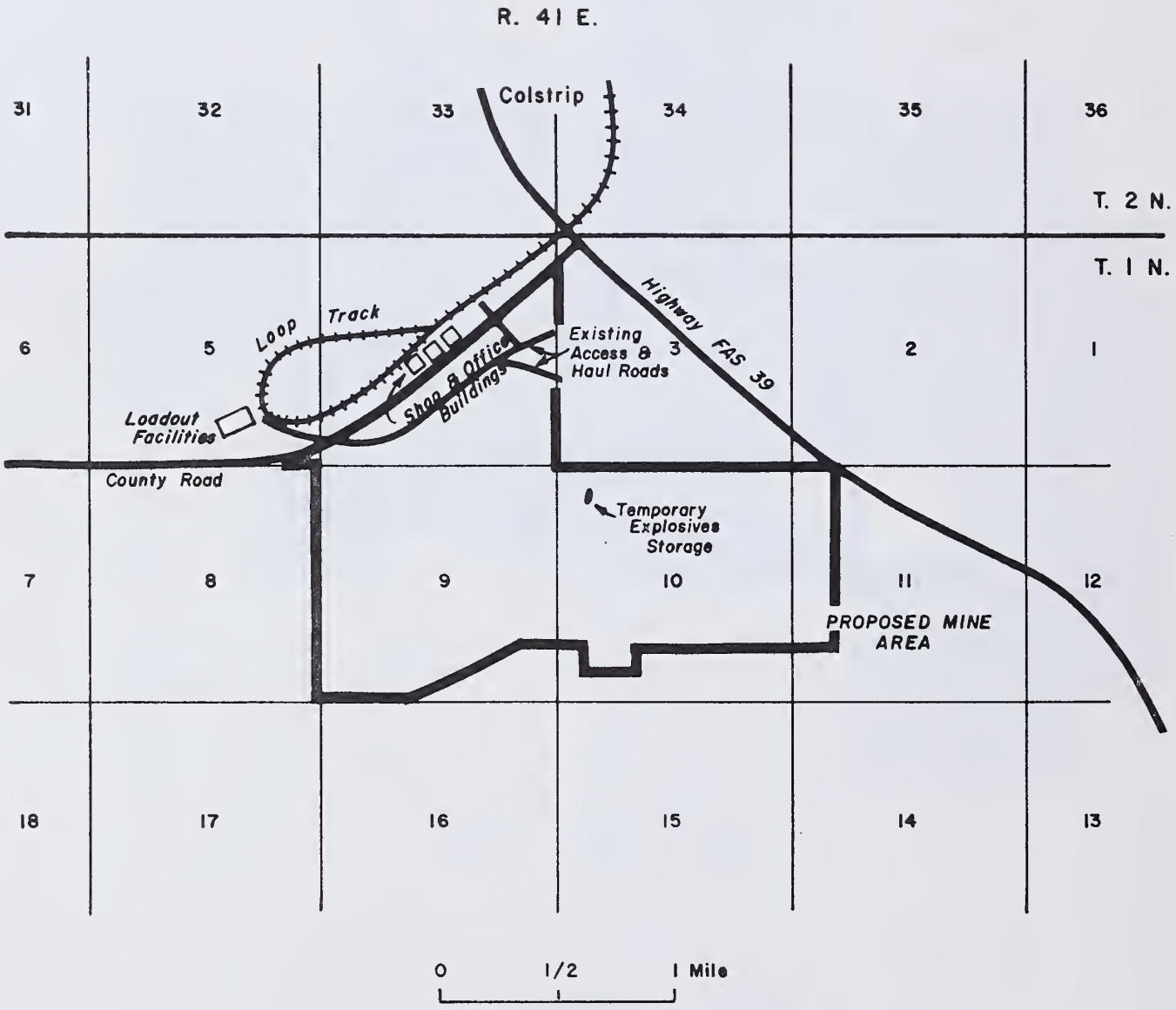

FIGURE I-4.--Location of facilities at Area B. Coal loadout and railroad loop is shared with Area A.

- Existing haul roads with new extensions into the pit.
- 115 kV and 12.5 kV powerlines from Colstrip.
- Portable substations to provide power to equipment in the pit.
- The Marion 8050 dragline.
- A scraper fleet.

3. Mining Sequence

Mining would progress from an existing haul road in section 4, T. 1 N., R. 41 E., southeasterly into sections 9 and 10. (See fig. I-1.) The dragline trenches would be oriented nearly parallel to Armells Creek in sections 4 and 9, swinging due east in section 10. WECO plans to apply in the future for the necessary mining permits to extend Area B beyond the present extension; sections 7, 8, 17, and 18, T. 1 N., R. 41 E. would be tied into the cuts proposed in sections 4, 9, and 10. Impacts of the additional extension are discussed in general terms in chapter IV, High Production Level.

4. Mining Methods

Topsoil and subsoil to be used for reclamation would be selectively salvaged using scrapers and dozers prior to removing overburden. The salvaged soils would be directly redistributed to regraded spoils where feasible. State of Montana regulations do not allow topsoil to be redistributed unless the area can be seeded within 90 days; therefore, some soils must be stockpiled for later use, e.g., redistribution on the highwall reduction area.

The overburden would be drilled and ammonium nitrate-fuel oil (ANFO) explosives used to loosen the overburden. After the overburden has been fractured, a Marion 8050 dragline with a 60-cubic-yard bucket would strip the overburden from the coal and deposit it in a pit where the coal has already been extracted.

The exposed Rosebud coal seam would be cleaned, drilled, blasted, and loaded by electric shovels into rubber-tired, bottom-dump haulers for transport to the existing crusher loadout tipple in Area A. The crushed coal would then be loaded into unit trains for transport to Midwest markets.

5. Reclamation Plan

To comply with the Montana Strip and Underground Mine Reclamation Act, WECO must reclaim and restore all disturbed lands to a use comparable to or better than the use prior to mining. WECO's proposed reclamation program includes the following measures: topsoil and subsoil salvaging; backfilling; regrading; highwall reduction; drainage reconstruction;

topsoil and subsoil redistribution; revegetation; and monitoring. WECO plans to plant native grass mixtures, and interseed and transplant forbs, shrubs, and trees, at a frequency similar to that which existed before mining. (See chapters II and III, Hydrology, Soils, and Vegetation.)

After being reclaimed, Area B would be used for domestic livestock grazing. WECO proposes to reestablish wildlife habitat within the mine area to conditions similar to or better than those existing before mining.

CHAPTER II

DESCRIPTION OF THE EXISTING ENVIRONMENT

This chapter describes the environment that would be affected by the proposed extension of Area B of WECO's Rosebud mine. Additional information on the existing environment is found in the previous environmental impact statement (EIS) on Area B. (Montana Department of State Lands, 1976). Information on region-wide conditions is contained in the regional analysis volumes of FES 80-1 (U.S. Department of the Interior and Montana Department of State Lands, 1980). The information in those EIS's has been updated in this chapter to provide a context for the discussion of environmental impacts in chapter III.

A. GEOLOGY

1. Topography and Geomorphology

The topography and geomorphology of Area B is typical of southeastern Montana. Bedrock underlying this region consists of relatively flat sediments of the Fort Union Formation. Water, wind, and other forms of erosion have modified the land surface to a series of prominent bedrock ridges and breaks separated by valleys. The bedrock ridges and breaks are composed of relatively erosion-resistant sandstone and clinker (porcellanite).

East Fork Armells Creek, the major drainage dissecting WECO's Rosebud mine, trends eastward until it reaches the community of Colstrip. From there it turns sharply to the north and eventually enters the Yellowstone River.

Area B lies south of East Fork Armells Creek and is drained by five short, northward-flowing ephemeral drainages which originate in clinker-capped sandstone bluffs and uplands 1 mile to the south. The bluffs drop abruptly to gently rolling, sandy, slopes. Topographic relief is about 340 feet, ranging from about 3,260 feet near East Fork Armells Creek to about 3,600 feet on the bluffs.

The area is not densely vegetated and erosion rates are high. Sheetwash and rainsplash are the dominant erosion processes, although some gullying has been observed. Headward sapping due to subsurface seepage and piping may cause the gullying. Slope runoff and high channel flows occur during spring snowmelt and during intense rainstorms.

2. Overburden

Overburden texture in Area B varies greatly, ranging from loamy sand to clay. The chemical and lithologic properties of the overburden are also quite variable (table II-1). Molybdenum, cadmium, zinc, salt, and clay in some parts of Area B exceed State suspect levels. Suspect levels indicate that reclamation and postmining land use may be affected if spoils with these properties are moved near the surface. (See chapter III, Geology.)

TABLE II-1.--Overburden properties significantly exceeding State suspect levels

[State suspect levels are in parentheses]

Core hole	Location	Property
Section 4, T. 1 N., R. 41 E.		
N47-E54	NE 1/4 SE 1/4	Molybdenum: $\bar{X}$= 1.2 ppm (0.3 ppm)
N45-E52	SW 1/4 SE 1/4	Cadmium 80'-102': $\bar{X}$=1.9 (0.1-1.0 ppm)
N45-E54	SE 1/4 SE 1/4	Zinc 60'-65': 332 ppm 80'-85': 280 ppm 100'-105': 208 ppm (40 ppm)
Section 9, T. 1 N., R. 41 E.		
N44-E50	NW 1/4 NW 1/4	Salinity 0'-25': 5.9-9.9 mmhos/cm (4-6 mmhos/cm)
N44-E51	NE 1/4 NW 1/4	Salinity 0'-20': 4.8-8.1 mmhos/cm
N44-E54	NE 1/4 NE 1/4	Zinc 55': 28% > 40 ppm (40 ppm) Clay: 80' (38%) exceeds 40% clay (40% clay)
N43-E51	SE 1/4 NW 1/4	Salinity 0'-30': 4.9-7.5 mmhos/cm (4-6 mmhos/cm)
Section 10, T. 1 N., R. 41 E.		
N44-E56	NE 1/4 NW 1/4	Salinity 0'-25': 5.2-8.0 mmhos/cm (4-6 mmhos/cm) Clay: 30' (34%) exceeds 40% clay (40% clay) Molybdenum: all > 0.3 ppm; $\bar{X}$= 1.6 ppm (0.3 ppm)
N44-E58	NW 1/4 NE 1/4	Salinity 5'-20': 4.4-10.2 mmhos/cm (4-6 mmhos/cm) Clay: 60'-87' [to coal] $\bar{X}$=44%; 22' exceeds 40% clay (40% clay)
N43-E55	SW 1/4 NW 1/4	Clay: 40' (23%) exceeds 40% clay (40% clay) Molybdenum: all high; $\bar{X}$=1.1 ppm (0.3 ppm) Phosphorus very high (no limit)
N43-E56	SE 1/4 NW 1/4	Salinity 0'-25': 4.4-8.6 mmhos/cm (4-6 mmhos/cm) Clay: 35' (27%) exceeds 40% clay (40%) Molybdenum: all high; $\bar{X}$= 1.1 ppm (0.3 ppm) Phosphorus very high (no limit)
N43-E58	SW 1/4 NE 1/4	Clay: 35' (26%) exceeds 40% clay (40% clay) Molybdenum: generally high; $\bar{X}$= 2.4ppm (0.3ppm)
N43-E59	SE 1/4 NE 1/4	Clay: 35' (35%) exceeds 40% clay (40% clay) Molybdenum--moderately high; $\bar{X}$= 0.8ppm (0.3ppm) Zinc: samples at 70, 71, 130 ppm (40 ppm)

B. HYDROLOGY

1. Surface Water

Area B is within the East Fork Armells Creek watershed. Near Area B and the town of Colstrip, East Fork Armells Creek is an intermittent stream, flowing only during part of the year. The East Fork has a drainage area of 97.3 square miles. The proposed expansion covers 1,366 acres, or 2 percent, of this drainage area.

The proposed mine area is drained by portions of five northward-flowing ephemeral streams (fig. II-1). Currently, mining in section 3 of Area B disturbs three of these ephemeral drainages.

Surface flow is diverted around the active mine areas and directed to sedimentation ponds. Total inflow to all sedimentation ponds is lost to infiltration and evaporation; currently no streams that pass through the mine discharge directly to East Fork Armells Creek. Western Energy has applied to the Montana Department of Health and Environmental Sciences, Water Quality Bureau, for discharge permits.

One small spring is near the mine area in NE 1/4 NE 1/4, section 8, about 600 feet southeast of East Fork Armells Creek (fig. II-1). The flow may be as high as 10 gpm. The apparent source of the spring is several feet of clinker gravel underlying alluvium and colluvium within the tributary small coulee.

A stock reservoir in the NW 1/4 of section 10 (fig. II-1) has perennial storage (Van Voast and others, 1977, table 11). However, it was dry in late August, 1979.

Field investigations and data provided by Western Energy indicate that East Fork Armells Creek meets preliminary criteria for delineation as an alluvial valley floor (AVF). The Department of State Lands has not yet determined the accuracy of these findings. Although not within the mine area, the alluvial terraces of East Fork Armells Creek form the mine area's northern boundary. Should the Department designate an adjacent portion of East Fork Armells Creek as an AVF, further investigation of the mine's potential impact on the hydrologic function of the stream would be necessary.

Surface water in the mine area is used for stock watering. Currently, enough water exists to meet demands. No lands are irrigated with surface flow from East Fork Armells Creek within 2 miles of the mine area (Westech, 1979). The company plans to reestablish surface water as a watering source for livestock after mining.

Water quality in the mine area and in the East Fork is suitable for use by livestock (Van Voast and others, 1977, 1978; Dollhopf and others, 1978; Botz, 1978). Surface water is typically of the calcium-magnesium sulfate type and varies greatly in degree of mineralization. Total

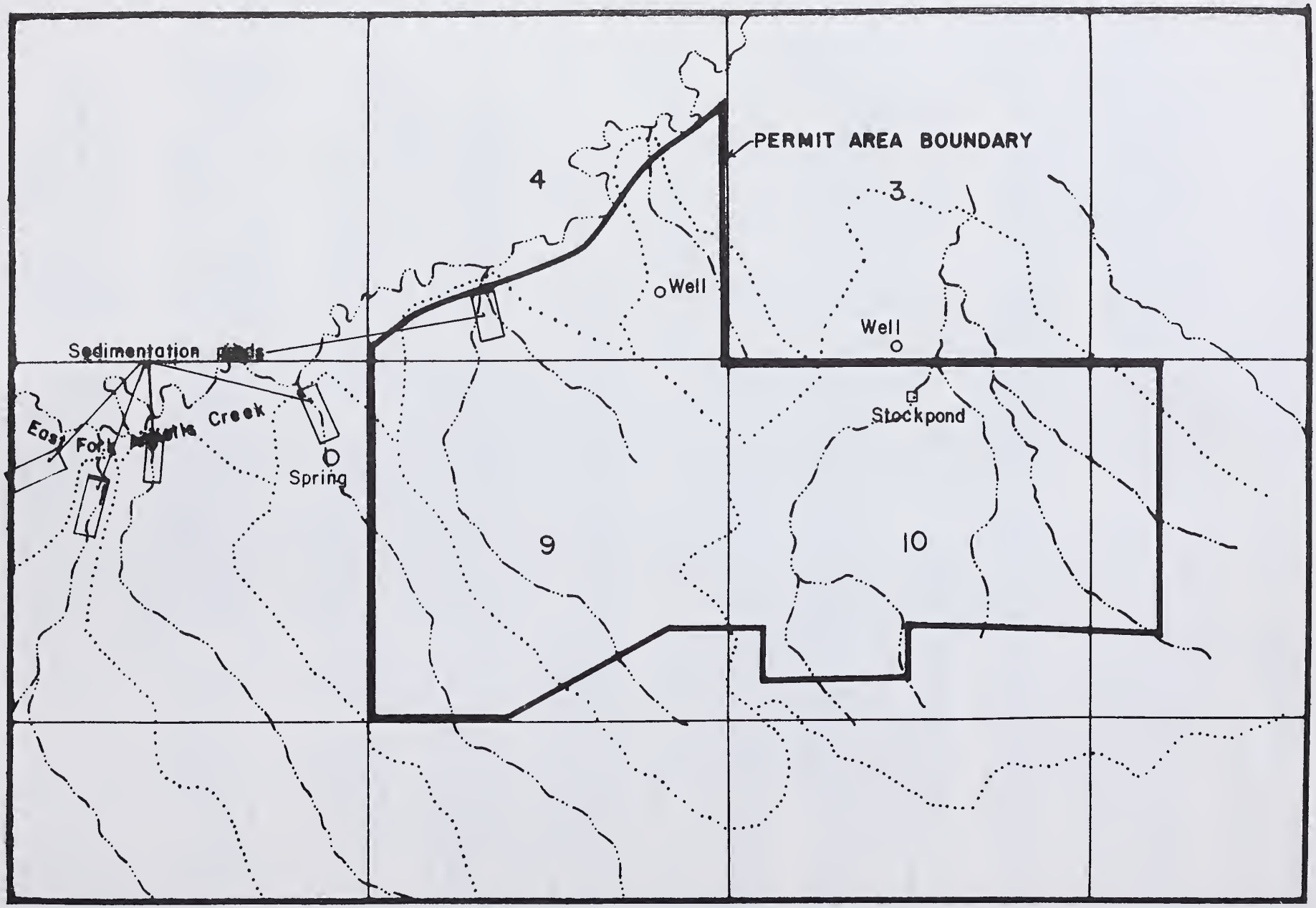

FIGURE II-1.--Drainage features in Area B. Dash-and-dot lines show ephemeral streams; dotted lines show drainage divides.

dissolved solids in all spring and well waters range from 420 to 5,860 mg/L (Van Voast and others, 1977). Total dissolved solids in water from East Fork Armells Creek are about 50 percent higher downstream from Colstrip than upstream (Van Voast and others, 1977). Chemically, water downstream from Colstrip is similar to that found in ponds in former Rosebud mine pits (Van Voast and others, 1977). This water may have decreased quality because of mining, although it is still within the natural range of water quality in the Colstrip area.

Concentrations of cadmium, lead, iron, manganese, sulfates, and total dissolved solids in East Fork Armells Creek occasionally exceed U.S. Public Health Service standards (Van Voast and others, 1977). These waters, however, are typical of those in the Colstrip area.

2. Ground Water

Ground water in the proposed mine area is used for stock watering and dust control in the mine pit and on haul roads. Two stock wells, one in section 4 and the other in section 3, are in the proposed mine area (fig. II-1). Ground water also contributes to the flow of East Fork Armells Creek and is the source of a spring in section 8 (fig. II-1).

The three important near-surface aquifers in the Colstrip area are, in descending order, East Fork Armells Creek alluvium, the Rosebud coal seam, and the McKay coal seam. Other important ground-water-bearing units also underlie the Colstrip area, but they would be not be disturbed by mining at the Rosebud mine and are not discussed in this EIS.

The alluvium of East Fork Armells Creek is locally as thick as 40 feet, with the lower 20 feet of sand and gravel generally overlain by like amounts of clay and silt. The alluvium passes much more ground water than either of the two coal seam aquifers; however, the area of alluvium is limited, whereas the two coal seams underlie much of the Colstrip area.

Ground water in the alluvium of East Fork Armells Creek generally flows parallel to intermittent channel flow. West (upstream) of the proposed mining in Area B, the alluvium is recharged from above by streamflow and precipitation, and laterally from subcropping bedrock aquifers. Downstream from Colstrip, the East Fork receives recharge from the alluvium (Van Voast and others, 1977).

The Rosebud and McKay coal seams are typically about 25 and 10 feet thick, respectively. The interburden between the coal seams varies in thickness throughout the area, is composed of clay, silt, and sand beds, and commonly acts as at least a partial hydraulic barrier to vertical ground water movement (Van Voast and others, 1977; Dollhopf and others, 1979). Accordingly, the Rosebud and McKay coal seams each possess a fairly distinct hydrologic system separated by the interburden. The McKay coal seam would not be mined, so it is not discussed further.

Ground water within the Rosebud coal seam generally flows eastward across Area B. Flow direction is controlled generally by structural gradient, variable transmissivities, and outcrop geometry (fig. II-2). Recharge occurs primarily in higher country west of the mine area. Discharge occurs to East Fork Armells Creek alluvium near Area B. Likewise, the coal seam discharges laterally to alluvium and colluvium at its outcrop, occasionally resulting in increased vegetative growth (Van Voast and others, 1977; Dollhopf and others, 1979).

The thin complexes of alluvium and colluvium underlying the several ephemeral coulees tributary to East Fork Armells Creek are of minor importance and support only rare patches of vegetation, although this unit is the probable source of the spring in NE 1/4 NE 1/4 of section 8 (fig. II-1).

Ground water quality varies widely and does not seem to be strongly correlated with any aquifer or stratigraphic position. No particular cation is dominant; however, sulfate is commonly the most typical anion, regardless of the aquifer (Van Voast and others, 1977). Nickel concentrations in ground water are generally higher in mined areas than in undisturbed areas around Colstrip (Van Voast and others, 1977). Lead concentrations in ground water may also be higher in mined areas, but lead in concentrations exceeding U.S. Public Health Service standards (.05 mg/L) are found in ground water in undisturbed aquifers in the Colstrip area, and the technique used to measure lead concentrations in water samples is suspect (Van Voast and others, 1977).

An increasingly high water table in the alluvium has reportedly greatly reduced hay crops over the past several years in meadows adjacent to East Fork Armells Creek downstream from Colstrip (Van Voast and others, 1977, p. 4). The affected rancher, Mr. J. R. Lee, has suggested to the Department of State Lands and other regulatory agencies that the mines, the generating units, and the wastewater treatment plant at Colstrip are directly or indirectly responsible for the rise in the alluvial water table downstream from Colstrip and the resulting waterlogged hay fields. (See FES 80-1, U.S. Department of the Interior and Montana Department of State Lands, 1980.)

No mine directly discharges water into East Fork Armells Creek; thus, Area B is not likely contributing to the problem of waterlogging. Water losses by seepage from ponds associated with Colstrip units 1 and 2 have been corrected or are insignificant (Botz, 1978).

The most likely causes of the waterlogging are an increase in precipitation in recent years, normal municipal runoff, and the point discharge to East Fork Armells Creek permitted for the Colstrip municipal wastewater treatment facility. Several dike and spreader irrigation systems along East Fork Armells Creek may have contributed to the problem.

The ground water hydrology of the Colstrip area is further described in previous environmental impact statements prepared by Montana Department

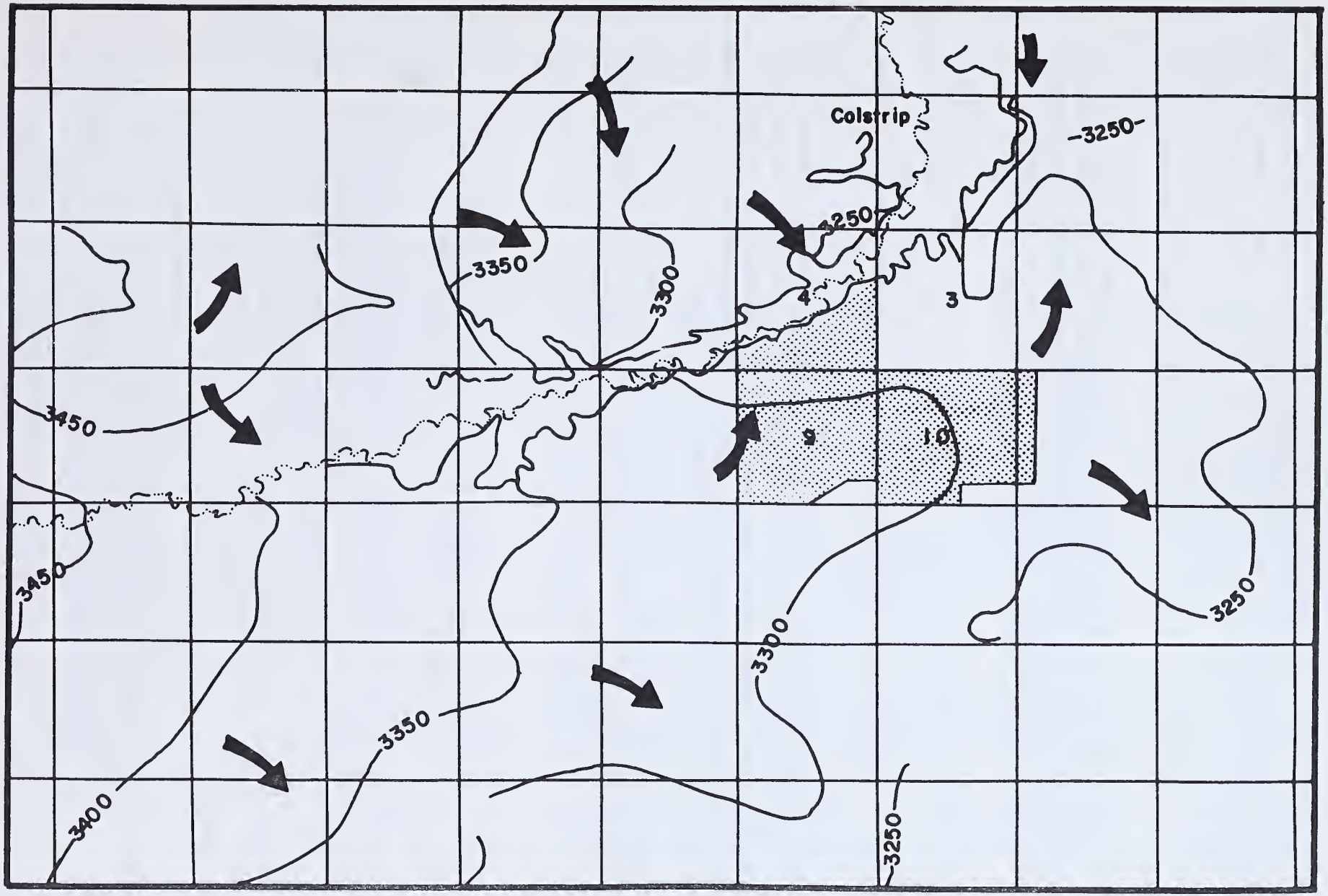

FIGURE II-2.--Piezometric surface (curved lines) and ground water flow directions (arrows) for Rosebud coal aquifer. Dot pattern shows Area B permit application. (Source: Van Voast and others, 1977, plate 5.)

of State Lands (1976, 1977) and by other investigators (Van Voast and others, 1977; Dollhopf and others, 1978; and Botz, 1978). All of these studies have investigated the relationships of surface coal mining and the local hydrology.

C. CLIMATE

The semiarid climate at Colstrip is typical of the continental steppes of the northern Great Plains. Precipitation is low but variable and falls primarily during the warmer months. Daily temperature variations are large, and seasonal temperature variations are pronounced. Surface humidity is low, and the prevailing wind speeds moderate.

Mean annual precipitation is 15.8 inches; about 50 percent occurs from April through June, 20 percent in the winter, and the remainder in the fall. Precipitation falls during 95 days in an average year. Recurrence intervals for 6- and 24-hour precipitation events are presented in table II-2.

Mean annual temperature is about 45°F. Temperatures are lowest in January, averaging about 8°F, and highest in July, averaging about 90° F. High midsummer temperatures and low precipitation terminate the effective growing season. Relative humidity is lowest in July and highest in winter. The freeze-free season is about 115 days.

Winds from the northwest dominate at Colstrip. Wind from a single 22.5-degree sector persisted for 12 or more hours on only 22 occassions during 1 year of measurement, 50 percent of these occurring during the

Table II-2.--Size of largest storm expected at Colstrip, Montana, during various lengths of time

Length of event	Size of largest storm (inches)						
	Number of years considered						
	2	5	10	25	50	100	200
6 hours[1]	1.00	1.30	1.60	2.00	2.20	2.40	-
24 hours[2]	1.25	1.74	2.04	2.38	2.62	2.83	3.03

[1]Values taken from Miller and others, 1973.

[2]Values calculated from precipitation records at Colstrip, 1948-1976.

winter (Super and others, 1973). Average winter wind speed ranges from 14 miles per hour (mph) at a height of 300 feet to 7 mph at ground level. Wind speeds greater than 17 mph occur less than 7 percent of the time. Vertical air movement at Colstrip is characterized by a high frequency of ground-based thermal inversions (Super and others, 1973) and an annual mean maximum mixing depth of 3,414 feet above ground level (Heimbach and Super, 1973).

The regional volume of FES 80-1 (U.S. Department of the Interior and Montana Department of State Lands, 1980) contains a detailed analysis of the climate at Colstrip. Climatic conditions have important effects on reclamation and revegetation success and on air quality impacts.

D. AIR QUALITY

The air quality at Colstrip has deteriorated significantly in the past 6 years. Prior to 1974, the Federal primary ambient air quality standard for annual concentrations of total suspended particulate (TSP) was not exceeded. Since that time, this standard has been violated every year but 1978 (fig. II-3). In 1977 the annual geometric mean for TSP in Colstrip was 92 ug/m^3; the next highest concentration in eastern Montana, 48.1 ug/m^3, was recorded at Ekalaka (Gelhaus and others, 1978). The 24-hour maximum allowable concentrations of TSP and the Montana State guidelines for dustfall (table II-3) have also been consistently exceeded since 1974. Due to these violations, a 120-square-mile area surrounding Colstrip was designated a "nonattainment area"[1] in 1978 (Federal Register 43 CFR 8962).[2] Monitoring data from throughout this area (open file report, Montana Air Quality Bureau) indicate that the TSP problem exists only in the immediate vicinity of Colstrip.

WECO has implemented a number of dust control measures since early 1978 (table II-4; see chapter III, Air Quality). These measures were estimated to reduce total particulate emissions in Colstrip by 150 tons/year; they were not sufficient to prevent the violation of the maximum allowable 24-hour concentration of TSP during the first 4 months of 1979. Table II-5 lists further dust control measures that WECO plans to implement in the near future. If these measures are implemented, the air quality at Colstrip would improve. However, with the construction of Colstrip units 3 and 4, and the concomitant increase in mining necessary to fuel them, it is not possible to determine whether the Colstrip area will comply with the Federal Ambient Air Quality Standards in the future.

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[1]The Federal Clean Air Act defines a "nonattainment area" as one which is shown by monitoring data or which is calculated by air quality modeling to exceed any national ambient air quality standard (Sec. 171(2)).

[2]WECO plans to petition the nonattainment designation (letter to Michael Roach, Montana Air Quality Bureau from Kenneth Williams, August 22, 1979).

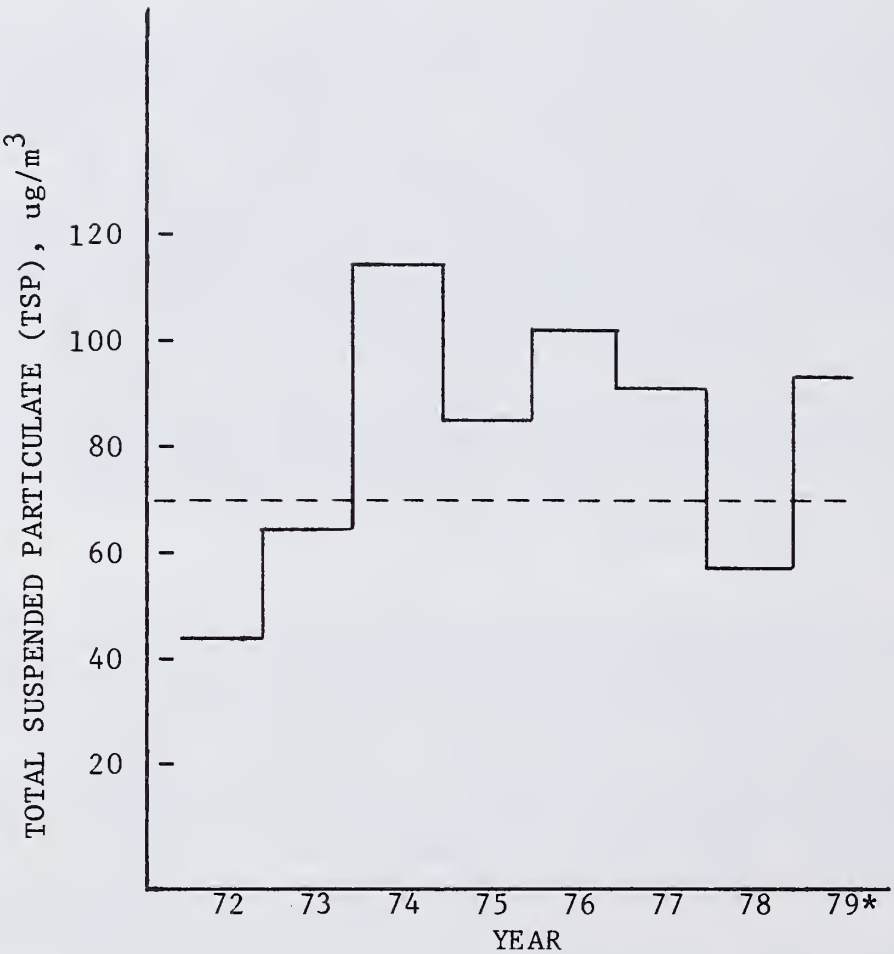

FIGURE II-3.--Annual geometric mean TSP concentrations in Colstrip, 1972-1979. Dashed line shows the Federal primary ambient air quality standard of 75 ug/m^3. *1979 data are for January through April.

TABLE II-3.--Montana ambient air quality guidelines

Pollutant	Guideline	Averaging Time
Suspended Particulate	75 ug/m^3	Annual
	200 ug/m^3	24 hour*
Sulfur Dioxide	0.02 ppm	Annual
	0.10 ppm	24 hour**
	0.25 ppm	1 hour***
Settled Particulate	15 T/mi^2 (residential area)	3 month
	30 T/mi^2 (industrial area)	3 month

*Not to be exceeded more than 1 percent of the days in a year.
**Not to be exceeded more than 1 percent of the days in a 3 month period.
***Not to be exceeded for more than 1 hour in any 4 consecutive days.

TABLE II-4.--Control measures taken since early 1978

Item	Estimated Reduction (tons/yr)
Burtco landscaping and street paving--17.5 acres.....	43.3
Lawn seeding, new homes--13.6 acres.....	32.9
Lawn seeding between schools--2.5 acres.....	6.0
Lawn seeding in plant area--0.6 acres.....	1.5
Paving of airstrip--8 acres.....	24.3
Seal coating of Pine Street--0.4 acres.....	1.5
Cherry Street paving--2.1 acres.....	7.6
Paving roads and lots in plant area--0.8 acres.....	2.5
Scoria placement on disturbed plant areas--5.8 acres....	8.8
Experimental treatment of haul roads with calcium chloride--3 miles.....	22.5
Total	150.9

Table II-5.--Control measures to be implemented in Colstrip

Item	Tentative Date
Areas removed from wind erosion	
Lawn seeding of new homes--13.6 acres	Spring-Fall 1980
Lawn seeding at two ball fields--3.7 acres	Spring 1980
Reclamation of borrow area, southwest portion of Colstrip--4.2 acres	Fall 1977
Colstrip units 1 & 2 warehouse and associated paving--2.35 acres	1980
MPC resource shop and associated paving--2.59 acres	1980
Paving parking lot in plant area--0.7 acres	Fall 1979
Road paving in plant area--0.5 acres	Fall 1979
Pave alley behind MPC 3--0.15 acres	Fall 1979
Total acreage = 27.2 Effective reduction = 83.3 tons/yr.	
Other control measures	
Water spraying active coal pile for units 1 and 2	Fall 1979
Apply crusting agent to dead storage pile--5 acres	Winter 1979
Apply calcium chloride to 12.7 miles of haul road	Spring 1980
Mulch and/or seed within 90 days of topsoil redistribution on reclaimed lands	Fall 1979

E. SOILS

Soils in the mine area are well developed (table II-6), reflecting topographically stable positions and the prevailing precipitation regime. (See chapter II, Climate.) Soils have average productivity--about 1,600 to 1,800 pounds per acre.

Capability groupings (Soil Conservation Service, delinated in WECO's Area B permit application) indicate that about 792 acres are suitable for cultivation with severe (Group III) or very severe (Group IV) limitations. About 246 acres are suitable for use as rangeland (Group VI and VIII). About 46 acres of soils and rock outcrops are unsuitable for cultivation or rangeland. None of the soils meets the criteria for prime farmland. Erosion is a major factor limiting land use, although dissected topography, frequently sandy texture, and periodic drought restrict use as well.

Important parameters of the most well-developed soil order, the Aridisols, include well-developed structure and profile development, (which contribute to good hydraulic conductivity, water holding capacity, and root penetration) and translocation and concentration of salts to mid- and lower portions of the soil profile. Salts limit the volume of soil which can be salvaged for reclamation. These soils occupy 784.8 acres, or 72 percent of the area proposed for disturbance. Aridisols would contribute 1974.1 acre feet (72 percent) of potentially salvageable topsoil material. (See table II-6.)

Mollisols with a moderately well-developed profile and a dark, enriched surface (A) horizon (layer) have been mapped on 7.5 acres (less than 1 percent), and constitute less than 2 percent (51.1 acre feet) of the salvageable soils resource.

Entisols, which are minimally developed, occupy 223.3 acres (21 percent) of the area, and would provide 695.6 acre feet (25 percent) of the salvageable soils. Salvage depth is usually limited by bedrock. (See tables II-6 and II-7.)

The remaining area, 68 acres (6 percent), is occupied by rock outcrops and minor soil inclusions. These soils could be salvaged to yield about 21.6 acre feet of soil material, or less than 0.1 percent of the total.

F. VEGETATION

Vegetation in the mine area is dominated by three major classes: rangeland, land disturbed in the past, and agricultural land (Sindelar, 1972; Ecological Consulting Service, 1975, 1976). The rangeland and disturbed land classes, although average in productivity potential, are currently below average, largely because of heavy grazing. As a result, few wildlife species use the mine area. However, vegetation adjacent to

TABLE II-6.--Soil resources in sections 4, 9, and 10 of Area B

Series	Subgroup	Projected acreage to be disturbed	Approx. soil salvage volume (acre feet)	
			Proposed	Potential
Birney	Borollic Camborthids	5.6	2.8	2.8
Busby	Borollic Camborthids	256.5	769.5	684.0
Cabbart	Ustic Torriorthents	76.4	83.1	152.8
Kirby	Ustic Torriorthents	2.8	1.4	1.4
Kobar	Borollic Camborthids	38.6	154.6	164.3
Kremlin	Aridic Haploborolls	7.3	36.5	51.1
Lonna	Borollic Camborthids	66.5	99.8	282.6
Unnamed	Borollic Haplargids	355.7	355.7	592.8
Yamac	Borollic Camborthids	61.9	185.7	247.6
Yawdim	Ustic Torriorthents	58.9	59.6	58.9
--------	Ustic Torriorthents	85.2	425.8	482.5
--------	Rock outcrop & soil inclusions	68.0	39.6	21.6
	Totals	1083.4	2214.1	2742.4

TABLE II-7.--Comparison of profile description for principal soils (>50 acre feet) in sections 4, 9, and 10 of Area B

Series & Profile number	Potential salvage depth	Limiting factor	Surface texture (<6")* %Clay/%Sand	Subsurface texture (>6")* %Clay/% Sand	Potential volume (acre feet)
Busby (2)	38"	Bedrock	11/82 (LS)	10/81 (LS)	684.0
Busby (8)	26"	Bedrock	8/82 (LS)	13/79 (SL)	
Cabbart (4)	22"	Bedrock	23/65 (SCL)	30/42 (CL)	152.8
Cabbart (7)	26"	Bedrock	12/54 (SL)	10/77 (SL)	
Kobar (18)	51"	Salts	32/29 (CL)	38/25 (CL)	164.3
Kobar (19)	52"	Salts	28/28 (CL)	32/29 (CL)	
Lonna (20)	32"	Salts	21/33 (L)	37/20 (CL/SiCL)	282.6
Lonna (21)	70"	Salts	32/31 (CL)	32/34 (CL)	
Unnamed (1)	17"	Salts	17/65 (SL)	24/62 (SCL)	592.8
Unnamed (6)	19"	Salts	30/31 (CL)	39/25 (CL)	
Unnamed (15)	28"	Salts	30/20 (CL/SiCL)	36/15 (SiCL)	
Ustic Torri-orthents (16)	>92"	Not reached	21/31 (L)	25/36 (L)	482.5
Ustic Torri-orthents (17)	45"	Salts	18/30 (SiL)	16/36 (SiL)	
Yamac (3)	36"	Bedrock	17/70 (SL)	21/61 (SCL)	247.6
Yamac (5)	60"	Bedrock	20/67 (SL/SCL)	20/58 (SL/SCL)	
Yawdim (9)	13"	Bedrock	35/43 (CL)	52/20 (C)	58.9
Yawdim (10)	14"	Bedrock	22/39 (L)	32/22 (CL)	
					2,665.5

*U.S. Department of Agriculture textural classes:

C= Clay
CL= Clay Loam
L= Loam
LS= Loamy Sand
SCL= Sandy Clay Loam
SL= Sandy Loam
SiCL= Silty Clay Loam
SiL= Silt Loam

(Slash (/) denotes soil bordering two textural classes.)

the mine area--riparian habitat in the drainage bottom of East Fork Armells Creek and ponderosa pine in the tall bluffs in the south--support numerous wildlife species. Rare, endangered, and threatened species are not known to inhabit the mine or adjacent areas.

Rangeland, consisting of grassland and shrub/grassland communities, is the most extensive class on the proposed mine area--about 1,210 acres. Recent heavy grazing has caused the distinctions between rangeland communities to blend, thus decreasing species diversity and severely limiting land use. (See Land Use.)

Agricultural lands, consisting of dryland winter wheat fields, is the second most extensive class on the mine area--about 110 acres. These fields currently produce between 30-35 bushels per acre--about average for southeastern Montana.

Land disturbed for residences and agricultural fields that have been allowed to revert to rangeland ("go back" lands) is the least extensive class on the mine area--about 40-50 acres. The succession of these "go back" lands has been retarded by heavy grazing; therefore they are well below their production capacity.

Three small stands of ponderosa pine, occupying only a few acres, lie within the mine area. These stands are not considered important for wildlife habitat, because they are not being used by wildlife now, and because more extensive stands exist south of the mine area.

G. WILDLIFE

Wildlife use the proposed mine extension area infrequently, mainly because the land has been heavily grazed and lacks both topographic and vegetative diversity. Adjacent areas, primarily the drainage bottom of East Fork Armells Creek and the bluffs south of the mine area, contain habitat more frequently used by wildlife. Rare, endangered, and threatened species are not known to use the mine area, and there are no fisheries.

The following discussion is based on studies by Ecological Consulting Service (1978).

Pronghorn antelope are the most freqently observed big game animal in or near the proposed mine area. Antelope have been observed on the proposed mine area during the spring, summer, and fall; however, the habitat type most often used by antelope (big sagebrush-grassland) would not be disturbed. No fawning sites have been observed in the proposed mine area. Two separate observations of a doe with a fawn were made within 1 mile of the proposed mine area.

Habitat for sharptail grouse (primarily sagebrush and skunkbush) is not extensive on the area to be mined. No known dancing grounds are in or near the proposed mine area.

Ring-necked pheasants mostly use the East Fork of Armells Creek north of the mine. The pheasants use creek bottom and nearby silver sagebrush habitat types more than other types. The area to be disturbed includes the creek bottom type but very little of the adjacent silver sagebush-grassland type.

Few Hungarian partridge use the mine area because of the limited amount of their favored habitat (open shrub grassland near dryland agriculture).

Red-tailed hawks, harriers, rough-legged hawks, and American kestrels use the mine area. No nests of these or other raptors have been found.

Coyotes are the only large predator observed on the mine area. Most coyotes have been observed in the coniferous forest habitat type with the remainder in the grassland habitat type. Distribution does not appear to change with the season. Observations of coyotes have declined since 1974 in direct response to the increase in fur prices.

H. SOCIAL CONDITIONS

About 400 people live in the Colstrip-Forsyth area as a result of the existing Area B mine--less than 1.5 percent of the total population of those towns. In 1977, 113 miners worked at Area B; an additional 8 ancillary workers in Colstrip and Forsyth were attributable to the mine workers. The families of the miners and ancillary workers accounted for the remainder of the 400. Construction of the Area B mine in 1976 coincided with a population decline due to the near-completion of Colstrip generating units 1 and 2. Rosebud County's population decline from 1976-1977 was about 60 people less than it would have been had there been no mining in Area B.

Local social impacts were fairly severe from 1976-1977; workers from the Area B mine added to those impacts. The previous EIS on Area B (Montana Department of State Lands, 1976) discusses some of the social impacts due to renewed mining which were identified by Gold (1974).

Colstrip, with its small premining population, changed rapidly into an industrial town when Western Energy reopened the old Northern Pacific mine in 1968. Forsyth was less dramatically affected because of its greater size and diversity of social units. Construction of the generating units at Colstrip had greater adverse effects on social conditions in Colstrip and Forsyth than mining. Most of the construction workers for the generating units were temporary and did not assimilate into the local society, whereas more of the miners brought their families and settled in the area.

In general, ranchers and those with low or fixed incomes were most severely affected by mining-related social changes. Social impacts identified by Gold (1975) included: shifts in the selection of friends;

strains in communicating with friends and neighbors of long standing; a shift in the established power structure from the ranchers to the new mining industrialists; the need to live with constant and increased uncertainties for which planning is difficult; keen interest in monetary gain at the expense of local values; the need to accommodate to newcomers' needs; and a loss in the sense of community. Recent research does not indicate the changes in those impacts that may have occurred since 1975.

Merchants and businessmen in Forsyth and Colstrip generally profited from the population influx beginning in 1968. When the boom from construction of the generating units ended in 1975, some merchants were unprepared for the business decline and were left with overstocked inventories. Some townspeople, however, enjoyed the social and cultural diversity brought by the new population (FES 80-1, U.S. Department of the Interior and Montana Department of State Lands, 1980).

Local attitudes towards coal mining and the generating units have varied widely and have caused differences among Colstrip and Forsyth residents. FES 79-29 (U.S. Department of the Interior, 1979) and the previous EIS on Area B (Montana Department of State Lands, 1976) document those attitudes. There is no current published information on whether attitudes and the resulting conflicts have changed in the last 4 years.

Colstrip residents are being exposed to levels of atmospheric particulate which exceed the Federal primary air quality standard established to protect human health. There is no evidence to date that respiratory problems among Colstrip residents are more frequent than among the general population, but the high levels of particulate suggest that health problems are a possibility. Little of the particulate in Colstrip comes from Area B, however.

According to FES 79-29 noise levels at some places within generating units 1 and 2 approach or exceed standards set by the U.S. Office of Safety and Health Administration, but most worker's stations within the units are in compliance. Noise from the units within the town of Colstrip could be considered a nuisance but does not approach health standards.

I. ECONOMICS

Data used in this analysis came from the COALTOWN computer model (Temple, 1978). For additional description of the existing economic environment in Rosebud County, see: FES 80-1; FES 79-46; FES 79-29; Rosebud County Planning Board (1979); Meadowlark (1979); and Montana Department of Natural Resources and Conservation (1974).

1. Employment and Income

The reopening of the Rosebud mine by WECO in 1968 began to change the structure of the economic base of Rosebud County. The employment

base became increasingly dominated by jobs directly associated with the mining and conversion of coal. (See table II-8.) Mining in Area B was an integral but fairly minor part of this process.

By 1977, nearly a quarter of the employment and half of the personal income in the county was directly related to coal mining and power generation. (See table II-9.) Area B did not create any ancillary (indirect) jobs when it opened in 1976. The ancillary sector had excess capacity as a result of the construction peak of units 1 and 2, so Area B helped mitigate the postconstruction decline in ancillary and basic employment.

From 1972-1977, Area B was responsible for about 10 percent of the total employment increases (basic and ancillary) in Rosebud County. (See table II-8.) About 120 persons are now employed at Area B. Only a few jobs in the ancillary sector exist because of Area B. Area B contributed about one-third of the employment growth due to the entire WECO Rosebud mine.

The mine employees are, on the average, better paid than workers in other economic sectors in Rosebud County. Average wages in the mining and construction sectors in 1977 were about $26,000; in manufacturing, $11,400; in trade, $8,400; and in services, $5,400. (See tables II-8 and II-9.)

2. Taxation

Fiscal conditions in Rosebud County have been described in detail in chapter 7 of the Rosebud County Planning Data Book (Rosebud County Planning Board, 1979), which is incorporated by reference.

Recent coal development in Rosebud County has had a major effect on the fiscal structure of Rosebud County. The taxable value associated with gross proceeds of the Western Energy and Peabody mines and the property of Montana Power's two coal-fired generating units have become the major source of the county's tax revenue. In 1970 the two categories represented less than one-fifth of the taxable value; by 1978, they exceeded three-fourths. This rapid growth in taxable value--nearly sevenfold between 1970 and 1978--is largely responsible for the decline in the county's tax rate, which fell from 54.55 mills in fiscal year 1971 to 26.632 mills in fiscal 1979.

This growth in taxable value occurred primarily near Colstrip and therefore has also benefited the Colstrip school districts. (See fig. II-4.)

Coal development has not equally helped all taxing jurisdictions in Rosebud County. The total mill levy in Forsyth has remained relatively constant, because the additional revenues needed to accomodate coal-induced growth has largely offset the reduction in the county's tax rate.

TABLE II-8.--Employment by broad industry and sector in Rosebud County, 1972-1977

[Source: U.S. Department of Commerce, 1979]

	1972	1973	1974	1975	1976	1977
Agriculture[1]	682	668	681	623	591	547
Mining	104	269	283	392	416	403
Manufacturing	265	192	180	160	146	52
Federal government	173	174	204	226	221	222
Construction (part)[2]	0	0	0	1,058	400	115
TCU[3] (part)[4]	25	12	11	0	0	7
Total economy	1,249	1,315	1,359	2,459	1,774	1,346
Trade	269	312	346	411	425	367
FIRE[5]	37	43	49	50	61	61
Services[6]	798	845	916	1,221	1,249	1,235
Construction (remain)	39	76	180	296	259	230
TCU[3]	167	181	201	210	226	231
Local and State government	367	402	466	549	559	574
Total ancillary	1,677	1,859	2,158	2,737	2,779	2,698
Total employment	2,926	3,174	3,517	5,196	4,553	4,044

[1]Farm proprietors plus farm wage and salary.
[2]Proportion greater than .0569 of total employment.
[3]Transportation, communications, and utilities.
[4]Proportion greater than .0571 of total employment.
[5]Finance, insurance and real estate.
[6]Includes: other industry wage and salary and nonfarm proprietors.

TABLE II-9.--Derivation of personal income in Rosebud County by place of residence

Item	1972[1]	1973[1]	1974[1]	1975[2]	1976[2]	1977[2]
Total labor and proprietors income by place of work[3]						
By type						
Wage and salary disbursements	12,556	17,079	21,911	50,598	41,457	36,572
Other labor income	882	1,448	1,854	4,050	4,030	3,958
Proprietors income[4]	3,943	8,529	4,357	1,953	1,683	2,018
Farm	2,165	6,520	2,397	-158	-506	-589
Non-farm[4]	1,778	2,009	1,960	2,111	2,189	2,607
By industry						
Farm	3,727	8,326	4,568	1,814	1,215	949
Non-farm	13,654	18,730	23,554	54,787	45,955	41,599
Private	10,405	15,031	19,057	49,005	40,066	34,747
Ag. serv., for., fish., and other[5]	146	119	128	152	333	211
Mining	1,285	4,279	4,914	8,291	10,237	10,575
Construction	534	1,020	3,389	26,952	14,794	8,969
Manufacturing	1,347	1,117	1,239	1,198	938	595
Non-durable goods	908	676	689	681	677	237
Durable goods	439	441	550	517	261	358
Transportation and public utilities	2,171	2,489	2,882	3,030	3,593	4,064
Wholesale trade	218	256	294	454	482	472
Retail trade	1,488	1,877	2,002	2,555	2,659	2,546
Finance, insurance, and real estate	275	312	375	404	585	638
Services	2,941	3,562	3,834	5,969	6,445	6,677
Government and government enterprises	3,249	3,699	4,497	5,782	5,889	6,852
Federal, civilian	1,240	1,365	1,638	2,047	1,746	2,267
Federal, military	81	90	110	139	143	155
State and local	1,928	2,244	2,749	3,596	4,000	4,430
Derivation of personal income by place of residence						
Total labor and proprietors income by place of work	17,381	27,056	28,122	56,601	47,170	42,548
Less: personal contributions for social insurance by place of work	721	1,066	1,371	3,127	2,505	2,139
Net labor and proprietors income by place of work	16,600	25,990	26,751	53,474	44,665	40,409
Plus: residence adjustment	-1,020	-1,466	-1,912	-10,841	-6,441	-4,976
Net labor and proprietors income by place of residence	15,640	24,524	24,839	42,633	38,224	35,433
Plus: dividends, interest, and rent[7]	2,508	3,338	4,309	5,149	5,877	6,623
Plus: transfer payments	2,546	3,013	3,565	4,426	5,246	5,500
Personal income by place of residence	20,694	30,875	32,713	52,208	49,347	47,556

[1]Estimates based on 1967 SIC.
[2]Estimates based on 1972 SIC.
[3]Consists of wage and salary disbursement, other labor income, and proprietors' income. Primary source for private non-farm wages: ES-202 covered wages - Montana Employment Security Commission.
[4]Includes the capital consumption adjustment for non-farm proprietors.
[5]Includes wage and salaries of U.S. residents working for international organizations.
[7]Includes the capital consumption adjustment for rental income of persons.

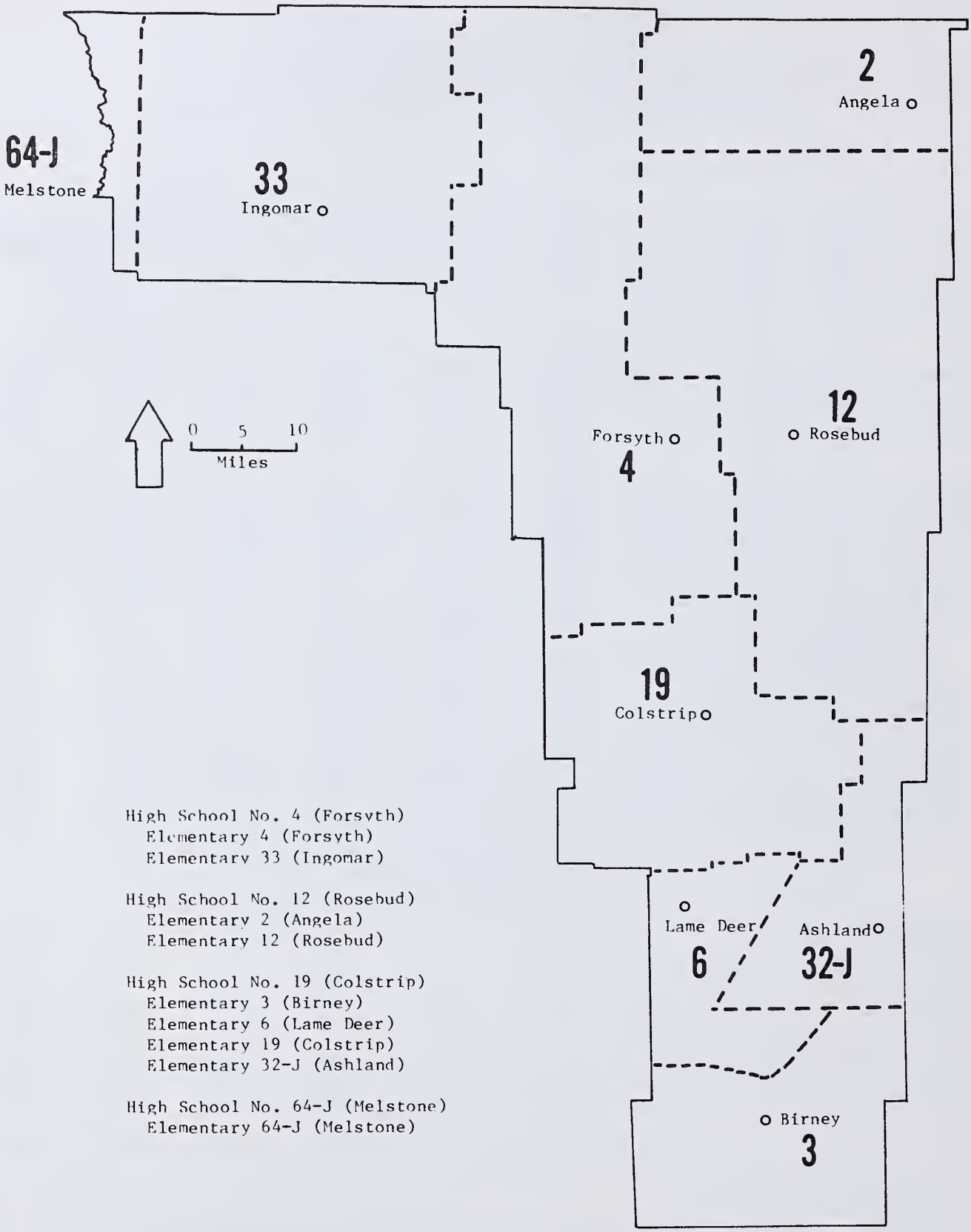

FIGURE II-4.--Rosebud County school districts.

J. COMMUNITY SERVICES

Community services in Rosebud County are not expected to be adversely affected by the Area B extension, and are thus not described in detail here. A detailed description of community services in the county is contained in chapter 6 of the Planning Data Book and Comprehensive Plan (Rosebud County Planning Board, 1979), and in FES 80-1 (U.S. Department of the Interior and Montana Department of State Lands, 1980).

Most community services and facilities in Rosebud County and its towns are now adequate. Social and physical services were expanded to accomodate the new population associated with Colstrip generating units 1 and 2. Between 1974 and 1978, more than $16 million worth of capital improvements (schools, water, sewer, fire, and police) were made in the county. A little over half of the improvements were financed with grants from the Montana Coal Board.

In Rosebud County, social and medical services are in shortest supply. People often have to travel to Miles City or Billings for medical care. Mental health and drug abuse programs are understaffed and underfunded. These problems existed in some degree before the recent upsurge in coal development, and are common in rural areas of the northern Great Plains.

K. LAND USE

Neither the land use pattern nor the productivity of the land on the 1366 acres of the proposed Area B extension is markedly different from that in the rest of Western Energy leaseholds, Rosebud County, or southeastern Montana. All but about 120 acres of the 1366 acres were being used for rangeland when Area B opened. (See table III-3.) Although this rangeland is in poor condition--probably as a result of heavy grazing in anticipation of mining (see chapter II, Vegetation)--in 1976 it was rated as "fair to good." The normal productivity of the mine area is average for southestern Montana, between .25 and .30 animal unit months (AUM's) per acre.

Mining in Area B has already disturbed about 380 acres (see table III-3), about 160 of which are currently being reclaimed. As yet, there has been no long term monitoring of reclaimed surfaces in the northern Great Plains and it is not known what the long term productivity potential of such land would be. For the short term (5 to 7 years after reclamation begins), vegetative productivity on the better sites will probably increase sharply. An equally rapid decline will probably be followed by a gradual increase (FES 80-1, volume 1, chapter II, Soils and Vegetation). The disruption of the soil structure and other characteristics would probably decrease the vegetation's optimum production. Given optimal management, the potential productivity of the reclaimed land will probably be slightly less than what it would have been had the undisturbed surface been given optimal management.

The cumulative land use impacts of the recent coal development in Rosebud County have been principally confined to the Colstrip and Forsyth vicinities and the transportation corridor between the two towns. About 1,720 acres of agricultural land have been temporarily displaced by mining (1,300 acres of rangeland and 420 acres of cropland). About an additional 550 acres in Colstrip and Forsyth have been permanently devoted to urban and industrial uses during the same time (Meadowlark, 1978; Rosebud County Planning Board, 1979; FES 79-46; and Michael Shea, WECO, oral commun., 1979).

The current general land use pattern in Rosebud County is described in detail in chapter three of the Planning Data Book and Comprehensive Plan (Rosebud County Planning Board, 1979). This information is incorporated by reference. The cumulative impacts of coal mining to date represent 0.07 percent of the grazing resource of Rosebud County's 2.5 million acres of range and pasture land and 0.3 percent of the nearly 130,000 acres of cropland.

L. TRANSPORTATION

Most people in the sparsely-populated Colstrip area travel by road. The road network, although not well developed, is generally adequate for the existing population. The main highways linking Colstrip with Forsyth and Lame Deer have been heavily used when mines and generating units were under construction.

Graveled county roads and two-lane State highways (fig. II-5) service the Colstrip area. Federal Aid Primary (FAP) 39 connects Colstrip with Interstate 94, the major east-west highway, to the north, and with FAP 37, a heavily used east-west highway, to the south. FAP 39 has numerous railroad crossings and originated for agricultural use; now it carries most of Colstrip's traffic. The Montana Department of Highways will improve 31 miles of FAP 39 between Interstate 94 and FAP 37 to meet existing and projected traffic demands. (See fig. II-5.)

FAP 37, intersecting FAP 39 at Lame Deer to the south, leads west to Busby, Crow Agency, and Hardin. Heavily used by trucks, this two-lane road presents dangerous driving conditions. The Highway Department is currently improving 24 miles of FAP 37 between Crow Agency and Busby (fig. II-5).

Traffic on the major highways leading to Colstrip has increased considerably betwen 1970 and 1978. (See table II-10.) Traffic on FAP 37 has increased about 60 percent. Traffic on FAP 39 from Colstrip to Interstate I-94 increased about 350 percent from 1970 to 1978. The Montana Department of Highways considers FAP 39 to be extremely unsafe --they rate it 1 on a scale of 20 for safety (Montana Department of Highways, 1978).

A railroad spur connects Colstrip and the Burlington Northern (BN) mainline 25 miles to the north near Nichols. (See fig. II-5.) The spur

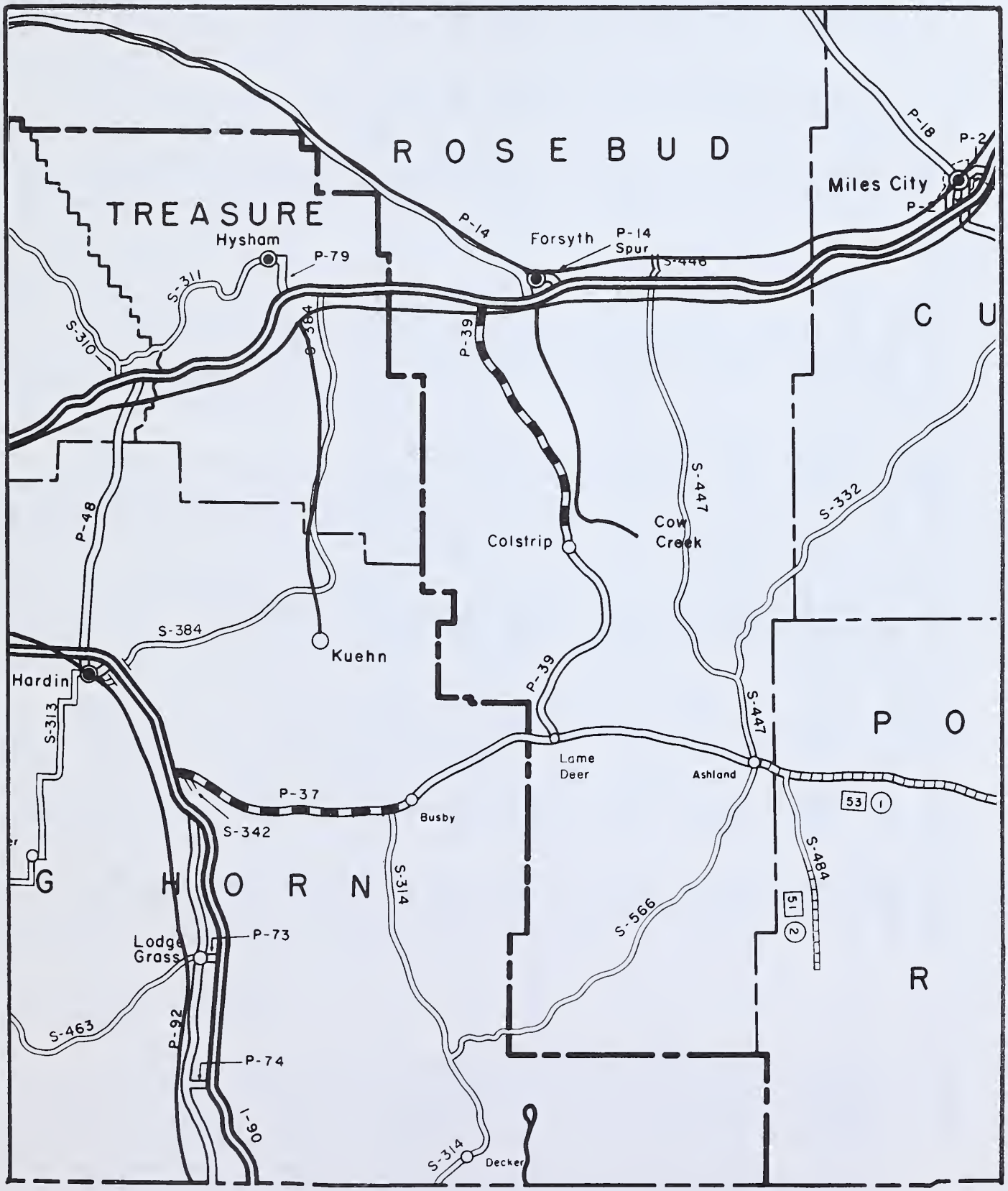

FIGURE II-5.--Transportation routes near Colstrip. Railroads--solid black lines; roads--parallel lines; highways being upgraded--dashes.

TABLE II-10.--Average daily traffic counts for highways near Area B, 1968-1978

[Source: Bob Keck, Montana Department of Highways]

Highway segment	Year										
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
FAP 37											
Jct. 342 to Busby.....	673	603	657	701	766	860	778	791	1,052	1,443	1,159
Busby to Rosebud County line.....	782	773	802	766	854	924	914	1,072	1,223	1,585	1,153
Rosebud County line to Lame Deer.....	858	850	863	820	962	1,033	1,011	1,263	1,243	1,800	1,370
FAP 39											
Lame Deer to Reservation boundary.....	238	274	320	363	395	---	---	---	359	511	585
Reservation boundary to Colstrip.....	159	170	195	203	269	508	451	498	388	344	364
Colstrip to I-94 interchange.....	210	190	236	253	370	1,193	1,047	1,425	1,087	783	678

services both WECO's Rosebud mine and Peabody's Big Sky mine 7.5 miles south of Colstrip. Coal from the Colstrip mine is shipped to such places as Billings, Montana; St. Paul, Minnesota; and Bayfront, Wisconsin.

The Colstrip spur, with its many railroad crossings, has been the source of several accidents (FES 80-1, volume 1, table II-44). About 35 unit trains/day currently leave the Big Sky and Colstrip railroad crossings, causing occasional traffic delays on FAP 39 (David Morgan, Montana Department of Highways, oral commun., October 1979).

M. RECREATION

No developed recreation facilities are in the permit area. The mine area is privately owned, and the opportunities for public use limited. Recreation facilities are found in adjacent communities within Rosebud County, most notably in Colstrip.

Outdoor recreation in the Colstrip area includes hunting, picnicking, camping, hiking, horseback riding, vehicular recreation, and winter trail activities, including snowmobiling. The Yellowstone River and its tributaries provide fishing and other water-related activities.

Urban recreation facilities in and near Colstrip include a 51-acre park system, a swimming pool, three tennis courts, three basketball courts, and five lots. A 16,000-square foot community center includes and exercise room and courts for basketball, handball, and racquetball.

The Colstrip recreation facilities are currently being used at their maximum capacity. Several new recreation sites and facilities have been proposed for the town of Colstrip, including a swimming beach with bath houses, a 9-hole golf course, bike paths, equestrian facilities, and additional ball fields and tennis courts (FES 80-1, U.S. Department of the Interior and Montana Department of State Lands, 1980).

For additional information, see FES 79-29 (U.S. Department of the Interior, 1979), Volume 1 of FES 80-1, and FES 79-46 (U.S. Department of the Interior and Montana Department of State Lands, 1979).

N. CULTURAL RESOURCES

Two archaeological sites have been identified within the mine area, and one historical site has been identified just outside the mine area (Fredlund, 1978). None of these sites will probably qualify for nomination to the National Register of Historic Places. The Montana Historic Preservation Office requires that most of section 9, T. 1 N. R. 41 N., be completely resurveyed. The Office of Surface Mining (OSM) requires that an area near the mine (but outside the area to be disturbed under the proposed permit) be surveyed for rock art, rock shelters, and standing structures (Judy Schafer, OSM, oral commun., November 1979).

The Old Homestead Site has been interpreted as a single-component, late-prehistoric bison kill and butcher site (about 1,000 years A.D.). Projectile points, broken and burnt bison bones, skinning and butchering tools, and three hearths were unearthed, but none of these is considered unique. The Well Collected Site was so named because amateur collectors removed or disturbed much of the original materials. This site may have been a rather extensive occupational site, but previous disturbances prevent further interpretation.

The West Homestead Site contains buildings made of cottonwood which are in various stages of collapse. The buildings, their structural style, and their history are typical of homesteads in the region. This site is outside the area to be disturbed under the proposed permit.

No rock art, rock shelters, or standing structures were found within the 1 mile buffer zone that has been intially inventoried. DSL and OSM require a buffer zone to preserve, to the extent possible, important cultural resources from the effects of blasting.

O. ESTHETICS

The mine area, although visually pleasant, is not esthetically distinctive. Area B contains fewer sandstone outcrops and less rugged topography than other parts of WECO's leasehold or the area around the Big Sky mine to the south.

The vegetation in Area B, mostly rangeland with scattered small stands of ponderosa pine, is well represented around Colstrip. Heavy grazing has lowered the area's attractiveness by reducing ground cover and making the vegetation appear clipped.

Landforms in Area B are typical of the Colstrip area. The most interesting feature is the bluffs rising several hundred feet at the south end of the area. Small buttes and ridges rise 50-100 feet above the rolling land between East Fork Armells Creek and the bluffs. The buttes and the bluffs have exposed sandstone outcrops which are attractive but not unusual in the Colstrip area. Some of the buttes and bluffs have reddish-tinged clinker outcrops which add to visual diversity, but more striking clinker beds are visible elsewhere around Colstrip. The top of one scoria outcrop south of the mine is now being excavated.

Most of Area B, including the spoil piles from existing mining operations, is visible from the State highway FAP 39 for several miles south of Colstrip and from the county road along East Fork Armells Creek. Because much of the land around Colstrip is dominated by industrial sights and sounds, the visible part of the Area B mine is unobtrusive.

Few occupied ranch homes are within hearing range of the blasting at Area B; only one is within close visual range of the mine. Colstrip residents can hear and see the mine but other sounds from nearby Areas A and E and from the generating units are more obtrusive.

CHAPTER III

IMPACTS OF WESTERN ENERGY'S PROPOSAL

This chapter describes the environmental impacts of the mining and reclamation plan ("mine plan") proposed by Western Energy Company (WECO). The analysis considers those mitigating measures specifically proposed by WECO as part of the permit application. Additional mitigating measures which could be required to meet existing laws and regulations are described in chapter IV.

Each section of this chapter begins with a summary of the anticipated environmental impacts. An impact on a resource is termed "significant" if it would exceed legal standards, if it would severely conflict with the use of the resource; or if it could reasonably be mitigated in an alternative mine plan.

A. GEOLOGY

1. Topography and Geomorphology

Impacts on topography and geomorphology from the Area B extension would be significant, because the company's mine plan would not minimize avoidable erosion or allow optimum vegetative growth. About 225 acres would probably not be returned to its anticipated postmining land use. This problem could be prevented by modifying the postmining topography and method of soil placement. (See chapter IV, Technical Alternatives.)

Zones on and immediately beneath reduced highwalls--about 150 acres--would be subject to severe sheet and rill erosion because of highwall configuration and slope. If sandy topsoil is placed on these steeper slopes, runoff would probably erode much of the topsoil, depositing it on lower toeslopes and inhibiting revegetation on about 75 acres (see chapter, IV, Alternatives).

Sediment eroded from the reduced highwalls would probably take years to degrade water quality in East Fork Armells Creek. The area may attain geomorphic equilibrium before this happens. If so, sediment loads in the creek would be limited. If not, sediment loads would considerably degrade water quality.

The rest of the postmining topography would probably be reasonably stable, but measures could be taken to break up the long, straight slopes WECO has proposed. The slopes could be replaced with more complex slopes, thereby reducing erosion. (See chapter IV, Technical Alternatives.) Reclaimed ephemeral drainages would integrate naturally with adjacent undisturbed lands.

2. Overburden

Impacts on vegetative reclamation from the replaced overburden at Area B would be moderately severe locally but generally insignificant

for the disturbed area as a whole. Placement of isolated pockets of certain overburden materials near the surface may cause various soil properties, such as clay, salt, zinc, cadmium, and molybdenum, to limit the success of reclamation. Proper placement would adequately mitigate most of these problems. (See chapter IV, Technical Alternatives.)

Increased molybdenum (Mo) levels exhibited throughout the mine area (table II-1) may be a potential problem. The importance of Mo levels has not yet been established for plants other than legumes, and legumes are not expected to be dominant in the reclaimed vegetative communities. Elevated Mo is associated with depressed copper (Cu) levels in plant tissues, especially in white and yellow sweet clover (Erdman and others, 1978). Animals grazing primarily on low Cu plants would be susceptible to molybdenosis, resulting in reduced growth rates, poor health, and, in extreme cases, death. Elevated Mo levels would probably not affect the success of revegetation.

Clay levels in section 9 (core hole N44-E54) exceeding the State suspect level would reduce infiltration and percolation rates, promoting runofff and erosion during intense storms. (See chapter II, Climate.)

Elevated salt levels in sections 9 and 10 may affect ground water quality. Water quality may also be affected by elevated phosphorus levels.

Locally elevated levels of cadmium in core hole N45-E52 in section 4 could slightly reduce vegetative quality. A significant adverse affect on grazing animals is not likely because elevated cadmium levels are not widespread, and because the reported values do not greatly exceed the State suspect level.

Zinc levels in one core hole in section 9 slightly exceed the State suspect level, but probably not so much as to inhibit vegetative reclamation success, due to the relatively low volume of affected material (28 percent). Zinc levels in core hole N45-E54 of section 4 are higher than those found in the core hole in section 9. The core hole in section 4 may have been contaminated during drilling; however, even if the values were accurate the zinc would not significantly inhibit revegetation because the volume of the material is less than 15 percent of the total core hole. The concentrations of zinc would therefore likely be reduced through dilution (Dollhopf and others, 1978).

B. HYDROLOGY

Hydrologic impacts of the Area B extension would not be significant, because existing uses of surface and ground water in the mine area would not be limited following mining. Ground water flow to East Fork Armells Creek would be restored following mining. The quality of water in the East Fork would be slightly reduced. The reduction in quality, however, is not anticipated to limit the present use of the East Fork. One stock

well would be mined out, but the company could be legally required to replace the well.

1. Ground Water

During mining, ground water in the Rosebud coal seam intercepted by the active pit would be used to water haul roads or diverted to settling ponds. The amounts diverted would be minor, because the Rosebud coal seam transports little water relative to the alluvium of East Fork Armells Creek to the north, and because only the pit endwall would intercept the flow from the coal seam. The diverted water would be returned to the ground water system in the same vicinity.

As the Rosebud coal is mined, some ground water in the alluvium of East Fork Armells Creek would be directed toward the mine pit, because the stratigraphic relationship between the base of the Rosebud coal seam and the alluvium would be reversed. The diverted alluvial water would be handled the same as ground water in the Rosebud coal seam, and thus would return to the local ground water system. Only about 1 mile of East Fork Armells Creek would be affected, and the amount withdrawn would be inconsequential compared to the amount flowing in the alluvial systems. If the East Fork is designated an alluvial valley floor, the short term disturbance of the alluvial aquifer during mining might not be acceptable. A determination of potential impact would have to be made by the Department if the East Fork were designated as an alluvial valley floor.

The quality of ground water during mining would not be appreciably changed because it would not be leached through spoils, and because suspended solids would be allowed to settle out in sedimentation ponds.

The Area B extension would not worsen the problem of waterlogging observed in a rancher's hay meadow on Armells Creek north of Colstrip, because mining would not increase the amount of ground water ultimately discharging into the flow system of East Fork Armells Creek. Possible causes of the waterlogging are discussed in chapter II, Hydrology, and in FES 80-1 (U.S. Department of the Interior and Montana Department of State Lands, 1980.)

After mining, ground water quality in the spoils and ultimately in the alluvium and surface flow of East Fork Armells Creek would be slightly reduced; however, the quality would remain within the natural range of the Colstrip area. Total dissolved solids would probably increase, as would concentrations of minor trace elements (Van Voast and others, 1977; 1978). Ground water flow into East Fork Armells Creek would be reestablished as replaced spoils became saturated. After several years or perhaps decades, ground water quantity and direction of flow would approximate premining conditions. (See chapter II, Hydrology.)

2. Surface Water

Sediment loads in East Fork Armells Creek would not increase substantially after reclamation. Sediment yield from the reclaimed mine would increase above premining rates for a period of years to decades, but the sediment would be held in sediment ponds. The ponds could not legally be removed until sediment yields returned to acceptable levels.

Studies by Lusby and Toy (1976) of the Big Horn and Dave Johnston mines in Wyoming documented increased surface runoff following mining and reclamation. The Dave Johnston mine has sandy soil similar to about one-fourth of the area to be mined at Area B. The Big Horn mine has soils with higher clay content similar to the remainder of the soils to be mined at Area B. The similarity in soils between Area B and the two Wyoming mines suggests that postmining surface runoff would be two to five times premining rates for a period of years to decades after mining. Sediment yield would increase accordingly.

Some of the erosion would come from the reclaimed highwall, which would be geomorphically unstable. (See Geology.) The amount of sediment which would be eroded is not known, but would last years or possibly decades until a new slope equilibrium is established. The increase in erosion from the highwall would be largely avoidable through an alternative mine plan and careful postmining management. (See chapter IV, Technical Alternatives.) Sediment ponds would intercept the sediment before it reached East Fork Armells Creek. If the ponds were removed, it would still require years before the increased sediment loads in East Fork Armells Creek become apparent, because postmining tributaries crossing the reclaimed surface would remain ephemeral.

The spring in the NE 1/4 of the NE 1/4 of section 8 (fig. II-1) would probably dry up, because its assumed recharge area would be removed by mining. The loss would not be significant because water for livestock use is available nearby. There are no known means to reestablish the spring.

Surface water runoff from undisturbed areas in the ephemeral watersheds above the active pit would be diverted around the disturbed area and into the sediment ponds, or used to water haul roads. The resulting reduction in the area's contribution to the surface flow of East Fork Armells Creek would be undetectable.

C. CLIMATE

Climate in the Colstrip area would not be measurably affected by particulate and gaseous emissions from the Area B extension. The generating units at Colstrip would emit much more of the particulate and gases that could potentially change local precipitation and temperature, but even the generating units would most likely have only minor effects on the climate. (FES 80-1, U.S. Department of the Interior and Montana Department of State Lands, 1980).

D. AIR QUALITY

Particulate and gaseous emissions from Area B would contribute slightly to the significantly reduced air quality in the Colstrip area--an area designated a "nonattainment area" for repeatedly exceeding Federal primary air quality standards. Impacts on air quality from the Area B extension would not be significant, however, because even if Area B were shut down, pollutant levels in the town of Colstrip would not be measurably reduced.

During occasional high winds, residents of Colstrip would probably continue to be exposed to high dust concentrations originating primarily from the coal storage piles at the mine loadout and the generating units. Coal from Area B makes up about one-third of the loadout storage piles. Miners would occasionally be exposed to potentially hazardous concentrations of total suspended particulate (TSP). Because the Montana State Implementation Plan "significant harm" level of 1,000 ug/m^3 for 24 hours has been exceeded in the past, it would probably be exceeded in the future. Measures that can mitigate these impacts are discussed in chapter IV, Technical Alternatives. Mining would not affect the class I airshed of the Northern Cheyenne Indian Reservation.

At an annual production rate of 2.9×10^6 tons, the potential particulate emissions would total about 2,100 tons/year (table III-1).[1] Control measures proposed by Western Energy would reduce those emissions to 1,200 tons/year--a 43 percent reduction.

Coal dust would account for 50 percent of the controlled emissions total; noncoal (soil overburden and topsoil) particulate for 48 percent; and gaseous emissions for 2 percent.

Coal particulate emissions would total over 700 tons/year. The transfer and storage of crushed coal would account for over 90 percent (646 tons) of these emissions. Because the crushed coal is "dropped" from the stacker to the storage pile, small particles are suspended and may travel long distances. Wind may also erode fine particulate from the storage piles and deposit them off the permit area. Dust plumes may rise as high as 2,500 feet and disperse as far as 7.5 miles downwind from the source (David Maughan, Montana Air Quality Bureau, oral commun., 1978). Coal dust deposited on vegetation may cause leaf lesions, stomatal clogging, and fruit set reduction (Rao, 1971). Dustfall rates measured by Rao (2.6 to 541 tons/mile^2/month) were similar to those measured in the Colstrip area. Unit trains may lose up to 1 percent of their coal in the form of dust (Michael Shea, WECO, written commun., 1978).

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[1]The accuracy of emission factors is subject to much debate. Until more information is available, the calculated emission should be used for comparison only.

TABLE III-1.--Estimated potential and controlled particulate emissions from Area B extension

Activity	Extent of activity per year	Emission factor	Uncontrolled emissions (tons/year) Coal	Uncontrolled emissions (tons/year) Other particulates	Reference	Control proposed by Western Energy	Percent efficiency	Controlled emissions Coal	Controlled emissions Other	BACT control strategy	Percent efficiency	BACT controlled Coal	BACT controlled Other
Topsoil and subsoil													
Removal	324,000	0.38 lbs/yd^3		61.6	1	---	---		61.6	---	---		61.6
Replacement	324,000	0.38 lbs/yd^3		61.6					61.6				61.6
Exposed areas	85.9 acres	3.02 tons/acre		259	1	Stabilization via revegetation within one growing season	75		64.8	Revegetation within one growing season	75		64.8
Overburden drilling	1,850 holes	1.5 lb/hole		1.4	1	---	---		1.4	Bag type collector on air drill	90		0.1
Overburden blasting	53 blasts	14.2-85.3 lb/blast		0.4-2.3	1	---	---		0.4-2.3	---	---		0.4-2.3
Overburden removal	13 x 10^6 yd^3	0.0056-0.053 lb/yd^3		36.4-344.5	1	---	---		36.4-344.5	---	---		36.4-344.5
Coal drilling	6,015 holes	0.22 lb/hole	0.7		1	---	---	0.7	---	Bag type collector on air drill	90	0.1	
Coal blasting	250 blasts	25.1-78.1 lb/blast	3.1-9.8		1	---	---	3.1-9.8	---	---	---	0.1 3.1-9.8	
Coal removal	2.9 x 10^6 tons	0.0035-0.014 lb/ton	5.1-20.3		1	---	---	5.1-20.3	---	---	---	5.1-20.3	
Haul road traffic	154,000 vmt	8.48 lb/vmt*		652.6		Treatment with $CaCl_2$	85		97.9	Treatment with $CaCl_2$	85		97.9
Coal dumping	2.9 x 10^6 tons	0.007-0.027 lb/ton	10.2-39.2		1	---	---	10.2-39.2	---	Negative pressure system	85	1.5-5.9	
Coal screening	2.9 x 10^6 tons	0.1 lb/ton	145		1	Enclosed	90(?)	14.5	---	Baghouse	99	1.4	
Coal crushing													
Primary	2.9 x 10^6 tons	0.02 lb/ton	29.0		1	Enclosed	90(?)	2.9	---	Baghouse	99	0.3	
Secondary	882,000 tons	0.06 lb/ton	26.5		1	Enclosed	90(?)	2.6	---	Baghouse	99	0.3	
Conveyors and transfer points	2.9 x 10^6 tons	0.2 lb/ton	290		1	---	---	290	---	Fully covered	100	0	
Train loading	2.9 x 10^6 tons	0.0002 lb/ton	0.3		1	---	---	0.3	---	Retractable chute	95	0	
Coal storage	3.5 surface acres (33.5% Area B coal)	1.6 u lb/acre/hr	41.0		1	---	---	27.1	---	Enclosed	99	0.4	
Surge pile	1.6 surface acres (33.5% Area B coal)	u = 3.3 m/sec	18.8		1	---	---	12.4	---	Enclosed	99	0.2	
Coal stacker	2.9 x 10^6 tons	0.204 lb/ton	296		2	---	---	296	---	Enclosed	99	3.0	
Diesel fuel	500,000 gal.	23.7 lb/10^3 gal		5.9	2	---	---		5.9	---	---		5.9
Gasoline	48,000 gal.	12 lb/10^3 gal		0.3	2	---	---		0.3	---	---		0.3
Unit trains	294												
Distance traveled	82 mile round trip Colatrip to Forsyth	1.07 lb/mile		12.9	3	---	---		12.9	---	---		12.9
Coal transported	2.9 x 10^6 tons	Unknown	Unknown			---	---	---	---	---	---		
Total			845.7-896.7 (avg.) 871.2	1092-1402 (avg.) 1247				664.9-745.8 (avg.) 690.4	343.2-653.2 (avg.) 498			15.2-41.5 (avg.) 28.4	341.9-651.9 (avg.) 497
Percent control								20.8	60.0			96.7	60.2

[1]U.S. Environmental Protection Agency, 1979, Air quality review of surface mining operations interim policy paper, Region VIII.

[2]U.S. Environmental Protection Agency, 1976. Compilation of air pollution emission factors AP-42 Part B, Second Edition Research Triangle Park, N.C.

[3]URS, 1976, Coal Train Assessment, Final report.

*Includes only particles less than 30 microns in diameter which may be suspended indefinitely.

Noncoal particulate emissions would range from an estimated 36 to 345 tons/year. The primary source of soil particulate would be overburden removal and dumping. Only when the dragline operates close to the permit boundary, or during rare high winds (see chapter II, Climate), would large amounts of soil particulate escape from the mine area. Haul road would be the other major source of soil particulate. The controlled emission rate of 98 tons/year would occasionally reduce visibility on the adjacent county road, as would dust emissions from coal and overburden blasting.

The anticipated increase in gaseous emissions is presented in table III-2. During inversions, nitrogen oxide (NO_x) emissions from blasting may reduce visibility, though infrequently. Emissions from unit-train diesel engines may temporarily increase ambient NO_x concentrations adjacent to the railroad corridor.

E. SOILS

Impacts on soils would be significant, because the company's mine plan does not maximize the soils resource potential. This would increase erosion and sediment yield, and limit reclamation potential on the entire minesite. The portion of the reclaimed surface that would be affected by high erosion and sedimentation rates (about 225 acres--see Geomorphology) would not meet reclamation requirements. These impacts could be avoided. (See chapter IV, Technical Alternatives.)

Under the proposed plan, a considerable proportion of the soil resource would be lost due to the lack of uniformity of salvageable soil depth (table II-7) and the absence of a supplementary soil sampling program to augment the 23 sample points in sections 4, 7, 8, 9, 10, and 11. (See chapter IV, Technical Alternatives, for possible mitigations).

Under the company's proposed soil salvage program, there would be a sufficient soil volume to cover the disturbed area to a depth of approximately 24 inches. If the soil resources were fully salvaged, an average of approximately 30 inches would be available. The additional depth of salvaged topsoil would increase the potential for successful revegetation.

WECO has not proposed selective placement or handling of sandy soils. As a result, the proportion of sandy soils would be higher on the reclamation surface than the natural surface (35 percent versus 25 percent) which would adversely affect vegetation (see Vegetation) and surface stability (see Geomorphology). The fine sandy textured topsoil would be highly erosive and would have a low water holding capacity. Both characteristics would be detrimental to plant growth, limiting revegetation potential. An alternative plan for selective handling and placement of these soils would reduce this potentially limiting influence. (See chapter IV, Technical Alternatives.)

The remaining soils have distinctly higher clay content (surface weighted average: 25 percent clay, 42 percent sand, subsurface weighted

TABLE III-2.--Estimated annual gaseous emissions from the Area B extension (tons/year)

Activity	Extent of activity/year	NO_x	SO_x	HC	CO	Aldehydes	Organic acids	HCN
Blasting[1]	1,243 tons ANFO[5]	2.0	---	---	26.5	---	---	0.1
Unit trains[2]	2,234 miles	190.8	29.4	48	67.2	2.9	3.6	---
Diesel fuel[3]	500,000 gals.	104.8	7.8	10.6	23.3	2.4	---	---
Gasoline[4]	48,000 gals.[6] 720,000 miles	10.1	0.3	10.8	136.8	5.3	3.6	0.1
Rosebud County population increase to 1990	341 people	58.0	23.9	44.3	115.9	---	---	---
Total		365.7	61.4	113.7	369.7	5.3	3.6	0.1

[1]Chaiken and others (1974).
[2]URS (1976).
[3]U.S. Environmental Protection Agency (1976).
[4]U.S. Environmental Protection Agency (1973).
[5]Ammonium nitrate-fuel oil, an explosive.
[6]At an assumed 15 miles/gallon.

average: 27 percent clay, 37 percent sand). Those soils would be relatively less erosive, but would have a reduced infiltration rate, resulting in increased runoff and erosion compared to the undisturbed soils. (See Geomorphology.) These soils are better suited to reestablishing vegetative growth and succession than the sandy soils. The volume of these higher quality soils could be increased. (See chapter IV, Technical Alternatives.)

Some impacts on the soils of Area B could not be avoided. These impacts include loss of structure, organic matter, pore space, pore continuity, and developed profiles. These and other related impacts, in turn, would result in increased runoff and erosion, reduced infiltration and percolation rates, and reduced water holding capacity. An apparent exception to decreased infiltration rates has been reported by Schafer and others (1979). An alternative mine plan could contain measures that would mitigate these adverse influences on vegetative reclamation.

Unavoidable impacts are addressed in considerable detail in chapter IV, Soils, of FES 80-1 (U.S. Department of the Interior and Montana Department of State Lands, 1980).

Sensitive management of any mined and reclaimed area is important during the decades following mining. Due to loss of structure and other unavoidable effects of disturbance, the replaced soils at and near the surface would be more sensitive to heavy grazing or motor vehicle use than undisturbed native range soils. Even sporadic agricultural misuse would have detrimental effects which would last indefinitely. The problems associated with long term management are discussed in greater detail in FES 80-1.

F. VEGETATION

The loss of 1,083 acres of vegetation within the mine area would not be significant, because the intended use of the land for livestock grazing would not be greatly curtailed following mining. Erosion and sedimentation due to the reduced highwall would inhibit vegetative establishment on about 225 acres (see Geomorphology), but that impact could be avoided in an alternative mining and reclamation plan.

Although seeding of the mined area would likely establish a vegetation cover on most of the graded and topsoiled lands during the first few years following mining, localized failures resulting from erosion and drought may occur and would require additional reclamation efforts to ensure vegetation establishment. Localized revegetation failures have occurred in the past, the most recent being the 1979 spring seeding which required reseeding in fall, 1979. WECO's proposed reclamation methods would be more likely to establish a diverse vegetation cover than previous methods employed at the mine. Diverse vegetation would be better able to withstand the droughts which can be expected to recur in the northern Powder River basin. Due to the relatively brief experi-

ence with modern reclamation, however, there is no complete assurance that mined areas with good initial revegetation will develop the necessary diversity or will be able to withstand normal land use and climatic patterns over many decades.

The relatively widespread Busby soil series could cause potentially serious erosion and drought problems owing to its sandy texture. This soil would erode excessively off the reduced highwall and would be deposited as sediment on adjacent footslopes. (See Geomorphology.) Erosion and sedimentation would inhibit revegetation. Vegetation on the Busby series would also be potentially subject to failure in droughts because sandy soils support less advanced vegetation communities (Sindelar and Plantenberg, 1979). Placement of the Busby soil series on areas of minimal slope instead of on the steeper reduced highwalls would minimize erosion and susceptibility to drought. (See chapter IV, Technical Alternatives, Soils.)

No impacts on rare or endangered plant species are expected because none are known to exist in or near the mine area.

Because WECO has not applied for "alternative reclamation" (82-4-233(7) MCA), the approximately 110 acres of wheat fields would not be reestablished.

G. WILDLIFE

Impacts on wildlife from the Area B extension would not be significant, because present wildlife use of the mine area is limited. Existing Hungarian partridge habitat would be lost, although suitable habitat is available in adjacent areas. Use of East Fork Armells Creek by pheasants, waterfowl, and other wildlife associated with riparian habitat would decrease slightly during active mining in Area B. Increased traffic associated with the mine may temporarily displace some species.

Successful reclamation and continued proper postmining management is essential to improving and reestablishing wildlife use of Area B following mining. Measures which would enhance revegetation success, and thus habitat for wildlife, are discussed in chapter IV, Technical Alternatives, Soils. Volume 1, chapter VIII of FES 80-1 (U.S. Department of the Interior and Montana Department of State Lands, 1980) discusses possible long term monitoring and research programs to promote successful management of reclaimed land. FES 80-1 also discusses possible measures to mitigate wildlife impacts, such as attempting to reclaim trees and shrubs in densities similar to those existing before mining. With successful revegetation and sensitive postmining management, wildlife habitat on Area B would likely be improved over the less-than-optimum conditions that currently exist.

No rare, threatened, or endangered wildlife species are known to use the mine area; thus, none would be disturbed.

H. SOCIAL CONDITIONS

Approval of the Area B extension would not significantly affect population growth or social conditions in Rosebud County. Growth due to the mine would be completely overshadowed by growth due to construction of Colstrip generating units 3 and 4. The increment of growth due to Area B would add only slightly to the additional social stresses expected to result from the construction of units 3 and 4.

The population of Rosebud County is projected to increase by more than 40 percent over the next decade--from 9,850 in 1979 to 13,900 in 1990. Area B would contribute between 140 and 200 persons--less than 1.5 percent--to the projected increase, most of which would be due to operation of Colstrip units 1-4, the Big Sky mine, and the remainder of the Rosebud mine.

The increment of growth from Area B alone would not cause rapid, stressful social change. Cumulative effects from construction of Colstrip units 3 and 4 and expansion of the Rosebud and Big Sky mines would be significant whether or not the Area B extension is approved. During the 2 or 3 years of most rapid growth, local governments, formal and informal institutions, and social networks in Colstrip and Forsyth would not be able to meet the demands placed on them (FES 80-1--U.S. Department of the Interior and Montana Department of State Lands, 1980).

If the Area B extension were approved and Colstrip units 3 and 4 were not built, existing social conditions identified in chapter II, Sociology would continue. Because the rate of growth would remain moderate, society would have time to adapt to the changes that have occurred. Local society would continue to reorganize to reflect the increasing presence of mining-related residents. Ranchers, who dominated the political and cultural life of the area before 1968, would continue to be an important, although less dominant part of local society. Cultural differences caused mainly by the influx of large numbers of newcomers would be less severe and would probably ease with time.

I. ECONOMICS

Rosebud County and the towns of Forsyth and Colstrip would not experience any significant adverse economic effects from the extension of the Area B mine. Employment at the mine would remain about the same, and ancillary (indirect) employment due to the mine would increase slowly. Revenues contributed by the mine and its employees would be commensurate with the increased costs of providing public services and facilities. The construction of generating units 3 and 4 at Colstrip would affect employment, income, and fiscal conditions in Rosebud County significantly more than the Area B extension.

The following documentation and explanation of economic effects is based on data from the COALTOWN computer model (Temple, 1978).

1. Employment and Income

The approximately 120 jobs attributable to the Area B mine would continue, representing about 6 percent of the total basic employment in Rosebud County by 1990--about the same as in 1979. From 1980 through about 1984, however, the contribution of Area B to basic employment in the county would become insignificant compared to the approximately 2,000 workers needed during the construction peak for generating units 3 and 4.

As part of the nationwide trend toward a greater number of ancillary jobs for each basic job, ancillary employment due to the Area B mine would increase slowly--from about 8 in 1979 to about 60 by 1990. New ancillary jobs would primarily be in the trades and services industries. The increase in ancillary employment due to Area B would be only about 2 percent of the total increase expected by 1990, most of which would be attributable to the construction and operation of generating units 3 and 4. Total ancillary employment in Rosebud County is expected to increase from about 2,700 jobs at present to about 4,900 jobs by 1990.

The average income of the mine workers would continue to be considerably higher than the average income of workers in other sectors. (See chapter II, Economics.)

2. Taxation

The taxable value of Area B and local property taxes paid by mine employees and other mine-related residents would be sufficient to pay for continued operation of the needed community services and facilities. Construction of generating units 3 and 4, however, would have the most substantial financial effect on Rosebud County; the taxable value of Area B would probably be less than 2 percent of the county total by 1990. From about 1980 to 1984, tax rates in the county and in Forsyth would have to be raised substantially above their current low levels to provide needed services and facilities to the Colstrip 3 and 4 construction workers and their families. Tax rates, however, would continue to be lower than in most other Montana cities and counties.

J. COMMUNITY SERVICES

Impacts on community services in Rosebud County from the Area B extension would not be significant, because the existing services and facilities in Forsyth and Colstrip would be sufficient to accomodate the minor population increases due to the mine. The cumulative impact of Colstrip generating units 3 and 4, and, to a lesser extent, the Rosebud and Big Sky mines, will be comparable to that experienced during the construction of generating units 1 and 2 from 1973 through 1977. The Area B extension, however, would contribute very little to this temporary overloading.

The following social services in Rosebud County would be significantly strained during construction of generating units 3 and 4 from 1981 through about 1984. Mental health services, including drug and alcohol counseling and treatment, crisis intervention, family counseling, and institutional screening, would be strained the most, mainly because those services are not fully supplied at present. Area B would contribute relatively little to the anticipated need for social services.

Physical facilities would not be significantly strained in either Forsyth or Colstrip. The planned expansion of schools and the sewer and water system in Colstrip should be sufficient to handle the 80 percent of the generating units' construction force expected to locate there. About 20 percent of the construction workers would locate in Forsyth, but the improvements in Forsyth's water and sewer system made in response to generating units 1 and 2 should accomodate the expected population influx.

K. LAND USE

Livestock grazing on about 225 acres of the reclaimed Area B mine would be moderately to severely limited due to problems with vegetation establishment. (See Geomorphology, Soils, and Vegetation.) This impact, which could be avoided under an alternative mining plan, would not significantly affect land use patterns or agricultural production in Rosebud County.

Mining and initial reclamation would preclude livestock grazing on about 1,366 acres of Area B until 1990; the remaining reclamation would further preclude normal livestock grazing until about the year 2000. (See table III-3.) During the same 20 year period, the entire WECO Rosebud mine, the Big Sky mine, and Colstrip generating units 1-4 would displace livestock grazing about 24,000 acres--less than 1 percent of the available grazing land in Rosebud County. Although the majority of the displacement would be temporary, the construction and operation of Colstrip units 3 and 4 would result in about 890 acres being permanently devoted to urban and industrial uses, mostly in Colstrip but perhaps as many as 40 acres in Forsyth, where some of the workers would live. (FES 79-29--U.S. Department of the Interior, 1979). Area B would contribute negligibly to this additional urban and industrial land use because the number of people attributable to Area B would increase only slightly.

The Area B extension would mine 110 acres of cropland. All projected mining and power generation near Colstrip would consume about 800 acres of cropland--only 0.6 percent of the available acreage in Rosebud County.

Given adequate management, the postmining vegetative productivity on most of the reclaimed surface would not be significantly lower than the normal premining productivity. The approximately 225 acres that would be affected by erosion from the reduced highwall would have impaired vegetative productivity unless measures to prevent erosion were adopted. (See chapter IV, Technical Alternatives.)

Table III-3.--Western Energy land use summary

[Data are in acres. Leaders (---) indicate data are not available]

	Premining		Condition 10/1/79		1990	
	Total	Area B (secs. 3, 4, 9, 10)	Total	Area B	Total	Area B
Undisturbed						
Crops	1,420	220	1,000	110	800[2]	0
Ponderosa pine	7,440	10	6,900	10	6,300	0
Rangeland	16,840	1,471	16,143	1,198	12,793	279
Subtotal	26,000	1,701	24,043	1,318	19,893	279
Disturbed						
Active mining, spoils, and highwall reduction area	0[1]	0	300	160	550	200
Facilities & haul roads	0	0	300	60	700	60
Associated disturbance	0	0	100	---[3]	1,000	---[3]
Reclamation	0	0	1,200	160	2,800	1,159
Subtotal	0	0	1,900	380	5,050	1,419
Bond Release						
Crops	0	0	0	0	0	0
Ponderosa pine	0	0	0	0	0	0
Rangeland	0	0	0	0	1,000[4]	0
County road	0	0	57	3	57	3
Subtotal	0	0	57	3	1,057	3
Total	26,000	1,701	26,000	1,701	26,000	1,701

[1]About 1,600 acres of unreclaimed spoils remain from the original Northern Pacific mine near but not formally part of the Western Energy mine.
[2]Preliminary estimate.
[3]Included in active mining.
[4]Assumes no problems in certifying reclamation success; may be overestimated.

L. TRANSPORTATION

Impacts on transportation from the Area B extension would not be significant. Road traffic associated with the mine would not exceed present highway capacity. Rail capacity would not be affected because coal production at Area B would not be increased.

The average daily traffic on FAP 39 from Colstrip to Interstate I-94 would increase about 10 vehicles/day by 1983--slightly more than 1 percent above the 1978 average level of 678 vehicles/day. That increase would be insignificant relative to the additional 550 vehicles/day expected to result by 1983 from the construction of Colstrip units 3 and 4. Total traffic on FAP 39 would increase to an average of about 1,300 vehicles/day in 1983. The road's capacity would not be exceeded, however, because the Montana Department of Highways is improving the major highways in the area--FAP 39 and FAP 37.

Rail traffic on the Colstrip spur would increase over the 1970's level about 30 percent through the 1980's. This would not exceed capacity. Area B would not contribute to this increase.

M. RECREATION

Mining would not significantly impact recreation in the mine area, because no developed recreation facilities exist, and because the land is not generally used by the public--only occasionally by hunters and snowmobilers. The mine, however, would contribute slightly to overloading an already strained carrying capacity for recreation facilities in the Colstrip area. Future population increases between 1980 and 1984, associated with the construction of generating units 3 and 4, would considerably reduce recreation enjoyment of long term residents and visitors. Residents would be aware of increased crowding and litter at and near developed outdoor recreation facilities. The facilities proposed for construction in Colstrip, mentioned in chapter II, would not adequately mitigate this problem.

N. CULTURAL RESOURCES

Impacts on cultural resources from the Area B expansion would probably not be significant because none of the area's known archaeological and historical sites appears to be eligible for nomination to the National Register of Historic Places. However, further inventories have been required by the State Historic Preservation Office and the Federal Office of Surface Mining. (See chapter II, Cultural Resources.) Mining would consume the area's two archaeological sites. Blasting from mining may slightly increase the rate at which the structures on the one historical site would deteriorate.

O. ESTHETICS

Long term esthetic impacts would not be significant because the topography and vegetation on the reclaimed mine would not seriously contrast with the surrounding unmined land. The moderately diverse topography in Area B would be replaced by a smoother reclaimed surface with a less natural appearance, but the landforms that would be lost are not unusual for the Colstrip area or the northern Powder River coal basin.

During the next decade, mining would continue the sights and sounds described in chapter II, Esthetics. Those impacts, however, are not significant because of the prevalence of similar sights and sounds from the mines and generating units near Colstrip. One or possibly two draglines would be moved into Area B and would be visible from nearby roads. When mining is completed, industrial sounds would be less obvious in the area and the spoil piles and dragline(s) would no longer be present.

Following mining, the small buttes and ridges in Area B would be replaced with a gently rolling surface, reducing topographic diversity and esthetic appeal. Maximum slopes would be about 10 percent. Most of the bluffs south of the mine--the most distinctive part of the area--would not be disturbed; however, the highwall reduction area as currently proposed would grade up into the bluffs and would have a long, flat slope similar to highway backcuts. Such a slope would conflict with the surrounding unmined topography and would be clearly visible from nearby roads. An alternative method of reducing the highwall, such as leaving some sandstone ledges and small cliffs, could mitigate this impact.

Initial revegetation on the reclaimed surface would likely be more attractive than the existing vegetation, which has been heavily grazed. Over the long term, successfully reclaimed vegetation would not be easily distinguishable from surrounding unmined land. Erosion and sedimentation would probably cause reclamation failures in spots (see Geomorphology); the resulting bare ground and possible gullies would detract from the appearance of the reclaimed vegetation.

CHAPTER IV

ALTERNATIVES TO APPROVING THE PERMIT AS PROPOSED

This chapter considers alternatives to approval of Western Energy Company's (WECO's) proposed mine plan. The administrative alternatives available to the Department of State Lands include denial of the permit, selective denial of portions of the permit, and approval of the permit subject to stipulations. Possible stipulations which would reduce the environmental impacts identified in chapter III are discussed as technical alternatives. Any of these alternatives could be chosen if necessary to reduce the environmental impacts of the proposed mining or to comply with legal requirements and the lease terms. This chapter also considers the environmental impacts if Western Energy were to extend its mine into sections 7, 8, 17, and 18 of T. 1 N., R. 41 E.

A. ADMINISTRATIVE ALTERNATIVES

1. Department of State Lands

Other than the decisions to approve or disapprove a permit, only two alternatives are available to the Department: (1) approval of the permit with modification; and (2) selective denial of the permit to mine in a specified area that includes lands having special, exceptional, critical, or unique characteristics, or where mining would affect the use, enjoyment, or fundamental character of neighboring land having the above special characteristics. Either or both of these alternatives could be invoked after the permit application was deemed complete, under the provisions of 82-4-227 MCA.

If no action were taken by the Department within 240 days after receipt of a complete application for a mining and reclamation permit, the permit would be statutorily approved by default.

Montana also does not have a formal administrative alternative to "defer action" following the receipt of a completed application for a mine and reclamation permit. However, the State may deem an application incomplete due to failure of the mine plan to meet State requirements, leading to a postponement of the action, which has the effect of deferral.

The Department may reject a proposed plan that does not meet the applicable laws and regulations under its authority. If Western Energy's current permit application were denied, and no further permits were issued for Area B, the company would have to end its Area B operations in the second quarter of 1980. This is evaluated as the "no permit-no replacement" and "no permit with replacement" scenarios in this chapter.

WECO would undoubtedly propose an alternative mine plan within Area B if the current permit application were denied. The impacts of such a revised plan cannot be determined at this time.

Until a revised mine plan were submitted and approved, Area B would continue in its present condition, subject to modification by

natural processes and by the continuation of other existing activity and uses, and to further modification by the surface owner to meet other uses.

2. Department of Health and Environmental Sciences

The Air Quality Bureau of the Department of Health and Environmental Sciences is requiring a permit application from WECO. (Michael Roach, Air Quality Bureau, written commun., 1979.) Upon receipt of the application, the Air Quality Bureau will decide whether WECO's existing air quality permit will have to be amended.

Decisions of the Department of Health and Environmental Sciences are not contingent on those of the Department of State Lands, with the result that disapproval by either agency would cause rejection of the entire project.

B. PRODUCTION LEVEL ALTERNATIVES

1. Low Production Level

There are two parts to the low production scenario: no area B permit with no replacement of coal production from other areas of the Rosebud mine; and no Area B permit with replacement from elsewhere at the Rosebud mine.

a. No Area B permit and no replacement

Coal production from Area B would cease after 1980 because WECO would run out of coal in its existing permit area in section 3. This would reduce the production for the entire Rosebud mine to about 14 millions tons/year by 1985.

Summary of impacts

Area B would not be disturbed and its current (but relatively low) grazing, wildlife, and recreation potential would be preserved. Soil and water resources would be undisturbed.

Impacts on air quality would be decreased only slightly--probably within the range of measurement variability.

Employment in Rosebud County over the next 10 years would grow slightly less than if the extension were approved. A hundred jobs would be lost in the basic sector and about 60 in the ancillary sector. Both sectors, however, would continue to grow because of other coal-related activities. The impacts on income would be minimal.

Traffic on FAP 39 and FAP 37 would be about 1 percent less than the level described in chapter III. The two archaeological sites, the Old Homestead and the Well Collected, would not be destroyed.

The existing spoils piles would be regraded and revegetation of mined areas completed 11 years sooner than under the company's proposal. Mining would be limited to areas of low relief.

b. No Area B permit with replacement elsewhere

Under this scenario the shortfall from Area B would be replaced by increased production elsewhere from the Rosebud mine (Areas A or E at first, or possibly Area C after 1983, and Area D after 1984). Overall production from the Rosebud mine would remain the same.

Summary of impacts

Impacts would be about the same for the no permit/replacement elsewhere scenario as they would for the no permit/no replacement scenario.

Mining in Area D may cause a minimal effect on ground water flow, while mining in Area C may induce significant net inflow from ground water storage (Van Voast and others, 1977). Depending upon actual layouts, locations, methods of mining, postmining ground water flow within the alluvium of East Fork Armells Creek could be reduced. Ground water impacts due to mining in Areas A and E would be negligible, primarily because the Rosebud coal seam in these areas contains little water.

Cultural resources inventories and mitigation measures are required for all proposed mine areas, so important cultural resources in other areas would be preserved or inventoried.

Esthetic impacts would perhaps be slightly greater than under the company's proposed plan, because parts of the Rosebud mine have slightly more visual diversity--in the form of buttes, ridges, and sandstone and scoria outcrops.

2. High Production Level

Under this scenario, WECO would add an overburden stripping shovel and increase its production from Area B by about 3 millions tons/year (mty). Production would reach a high of 7 mty in 1982 and would fall to 4.8 mty in 1984.

By adding sections 7, 8, 17, and 18, the company would be able to mine longer box cuts. These cuts would be oriented in the same direction as those in section 4, parallel to the general trend of East Fork Armells Creek. WECO controls the coal lease on all these sections, except the SE 1/4 of section 8, for which it is negotiating with the Bureau of Land Management. Overall production at the Rosebud mine would not increase over that of the company's proposal or the no permit/replacement elsewhere scenario. With increased production in Area B, other areas of the Rosebud mine would produce at lower levels, thus increasing the overall life of the Rosebud mine, though not the life of Area B.

Summary of impacts

Impacts for the high production scenario would be about as significant as those for the proposed plan. Surface hydrologic and geomorphic impacts would be proportionately greater than under the proposed plan if similar mining methods and reclamation techniques are used. At least two wells would also be removed. Ground water impacts would be considerably greater, due primarily to the increased diversion of flow from the East Fork Armells Creek alluvium toward a much longer active pit. Consequently, there would be a greater linear interruption of flow within the stream. Postmining conditions would likely be similar to those of premining, except that the spoils would require much more time to resaturate. Ground water quality within the spoils and adjacent and downstream alluvium would be considerably degraded, but they probably still would be within the natural range.

No known cultural resources of importance would likely be disturbed in sections 7, 8, 17, and 18 (Fredlund, 1978). The Advisory Council on Historic Preservation (National Register of Historic Places), in consultation with OSM and the Montana Historic Preservation Office, has not yet determined the eligibility of sites found in these sections.

Impacts on esthetics would be more extensive and would last about 2 decades instead of 1. The long term effect would differ little from the company's proposal, because the additional area mined contains no unusual or esthetically distinctive features.

C. TECHNICAL ALTERNATIVES

1. Alternative Mining Methods

WECO could align its mining cuts perpendicular to the slope contour instead of with the contour as currently proposed. If the cuts ran perpendicular to the contour (approximately north-south), spoils could be replaced at about the same elevation as they were mined. This would make it easier to fill in the final boxcut. This method, however, is not economical for a dragline operation such as Area B because the dragline would have difficulty climbing and operating on the upper slopes of Area B. This method may be feasible for other mines using trucks and shovels to remove the overburden.

WECO could be required to mine the McKay coal seam which underlies the Rosebud seam. WECO has not found a suitable market for the McKay coal due to the coal's tendency to slag at normal boiler operating temperatures. The possibility exists that WECO could find a buyer for McKay coal or blended Rosebud-McKay coal. Mining both the Rosebud and McKay seams would recover about one-third more coal per acre disturbed than mining the Rosebud seam alone.

Other alternative ways to mine coal from Area B do not appear to be practical. The following discussion is summarized from the Department's previous EIS on the Area B mine (Montana Department of State Lands, 1976).

Underground mining would not directly disturb the soil and stratigraphy overlying the coal, but the land surface would likely subside. The resulting subsidence depressions and holes would restrict the use of the land for livestock grazing. Coal fires are a hazard at abandoned underground mines; a coal fire has been burning at the Monarch mine in Sheridan County, Wyo., for years. Underground mining recovers considerably less coal than strip mining; the most efficient underground techniques (which would probably require more stable roof conditions than exist at Area B) recover about 80 percent of the coal, compared to 90 percent with strip mining.

Auger mining could possibly be used in conjunction with strip mining methods to recover coal a few hundred feet beyond the present economic limit of overburden removal. The holes left by auger mining could not be refilled and would lead to surface subsidence. Coal recovery would be less than 50 percent; the unmined coal could not be recovered by strip mining in the future.

Contour mining is possible only on seams that crop out along a contour, and in any event contour mining is prohibited under the Montana Strip and Underground Mine Reclamation Act.

Removal of the coal in solution or as a gas (in situ mining) is theoretically possible, but proven technology does not now exist.

2. Alternative Energy Sources

Mining at Area B is predicated on continued demand for coal. It does not appear likely that other sources of energy will soon replace WECO's current market for Area B coal.

Other fossil fuels such as natural gas and oil are in short supply. Conversion of coal-fired boilers to oil or gas is discouraged under Federal policy. Electric generation from nuclear power has not increased as fast as once predicted because of high capital costs and concern over safety. New sites for hydroelectric generation are limited. Solar power (including direct conversion, wind energy, and biomass utilization) is not likely to replace many existing coal fired generation facilities in the near future.

A nationwide program of energy conservation could significantly slow the rate of growth of electric energy use, but conservation would not likely make existing generating facilities obsolete in the next 10 years.

3. Additional Mitigating Measures

The following measures would mitigate the environmental impacts predicted in chapter III.

a. Soils

WECO could salvage more desirable soils than proposed in the mine plan application. (See table II-6.) The volume of soil proposed for salvage is approximately 25 percent less than that which could be salvaged if the full depth of suitable soil were saved. For example, the unnamed series (table II-7) has varying depths to which salvage is possible, ranging from 17 to 28 inches, averaging 21 inches. Based on the available data, an increase of 60 percent would be available for this soil series. This material is texturally variable, but all of it is of fair to good quality for reclamation purposes. The sandy and relatively poor quality soil material derived from the Busby soil series could thereby be reduced from 35 to 25 percent of the total soils.

Under the company's proposed soil salvage plan, there would be approximately 24 inches of soil material available for placement over spoils. With increased salvage, approximately 30 inches would be available. Preliminary results from field trials in the semiarid West indicate that 30 inches of soil material placed on regraded topsoil significantly aids successful revegetation. In addition, the increase in fair and good quality material would allow selective discarding of the small volumes of poor quality material that have excessive sand, clay or other undesirable characteristics.

WECO could also sample soils for critical parameters prior to salvage. This has been required of other mine operators in the region with similarly complex soils. Since the primary chemical limiting factor to salvage is excess salts, lab analyses could be limited to electrical conductivity, a relatively simple and inexpensive procedure. Field observations would permit accurate assessment of depth to either bedrock or texturally unsuitable soil. By increasing the sampling of soils, WECO would be better able to define the limits of salvagable soils, therefore allowing increased recovery of soils discussed above.

Another soils alternative would be the selective mixing of those soils which are temporarily placed in soil stockpiles. The Department requires the direct placement of soils wherever possible, but it also recognizes that a considerable percentage of the topsoil material be stored. In the process of storing soils, contrasting textured soils could be placed in alternate layers. When these soils are eventually picked up for placement on spoils, the operator could pick up the soils across the layers, affording a considerable degree of mixing.

Selective placement of soils by textural characteristics on the regraded surface would be a desirable alternative. To minimize the erosion problems discussed in chapter III, Soils, the sandy textured soils (primarily Busby) could be placed on areas of minimal slope, rather than on the steeper reduced highwalls. Heavier textured soils (higher in clay) would decrease infiltration and increase runoff, but would be less susceptible to erosion; clayey soils are more cohesive than sandy soils. Selective placement of these heavier soils on reduced highwall areas and slopes greater than 3-5 percent would probably decrease overall

erosion and increase the moisture-holding capacity of the soils, promoting better vegetative growth.

b. Geomorphology

To reduce erosion on the reclaimed reduced highwall, the velocity of overland flow should be decreased and infiltration increased. Currently, this is most commonly accomplished by mulching and depositing soil along contours. WECO's postmining contour map depicts long, straight slopes (fig. IV-1a). Mulching alone would not adequately stabilize these slopes, expecially if sandy soils were placed on steep areas. (See Soils alternatives above.)

The most effective manner by which overland flow velocities could be reduced is by altering slope profile design. By creating complex slopes, velocities will vary throughout the total slope length, and erosive forces will consequently be diminished.

The most effective way to create complex slopes at Area B would be to create a convex upper slope, straight midslope, and a concave toeslope (fig. IV-1b). Alternatively, the straight, reduced highwall slope profiles could be broken by leaving resistant bedrock units interspersed and ungraded along the length of the reclaimed slopes (fig. IV-1c). Examination of limited geologic data provided by WECO indicates the existence of such bedrock units in stratigraphic positions to be of such use.

Both alternative slope designs would enhance the goal of restoring the reclaimed surface to approximate original contour.

c. Air quality

WECO could initiate a monitoring program to obtain more accurate information on the contribution to particulate emissions from coal handling facilities, the coal storage pile, and open coal cars. The program would help determine whether the coal storage piles should be enclosed and whether coal shipped by unit train should be treated with hot oil.

Coal dust emissions from the handling facilities at Area A could be reduced 99 percent by fully covering all conveyors and transfer points, ducting emissions to a central baghouse. (U.S. Environmental Protection Agency, 1979). The baghouse could possibly be used in conjunction with a negative pressure truck dump, decreasing emissions there by 85 percent. Dust suppression measures proposed by the company are described in table II-5.

WECO could prevent the loss of 1 percent of the coal from unit trains by treating the coal with hot oil. This procedure is is use at the Decker mines in Big Horn County.

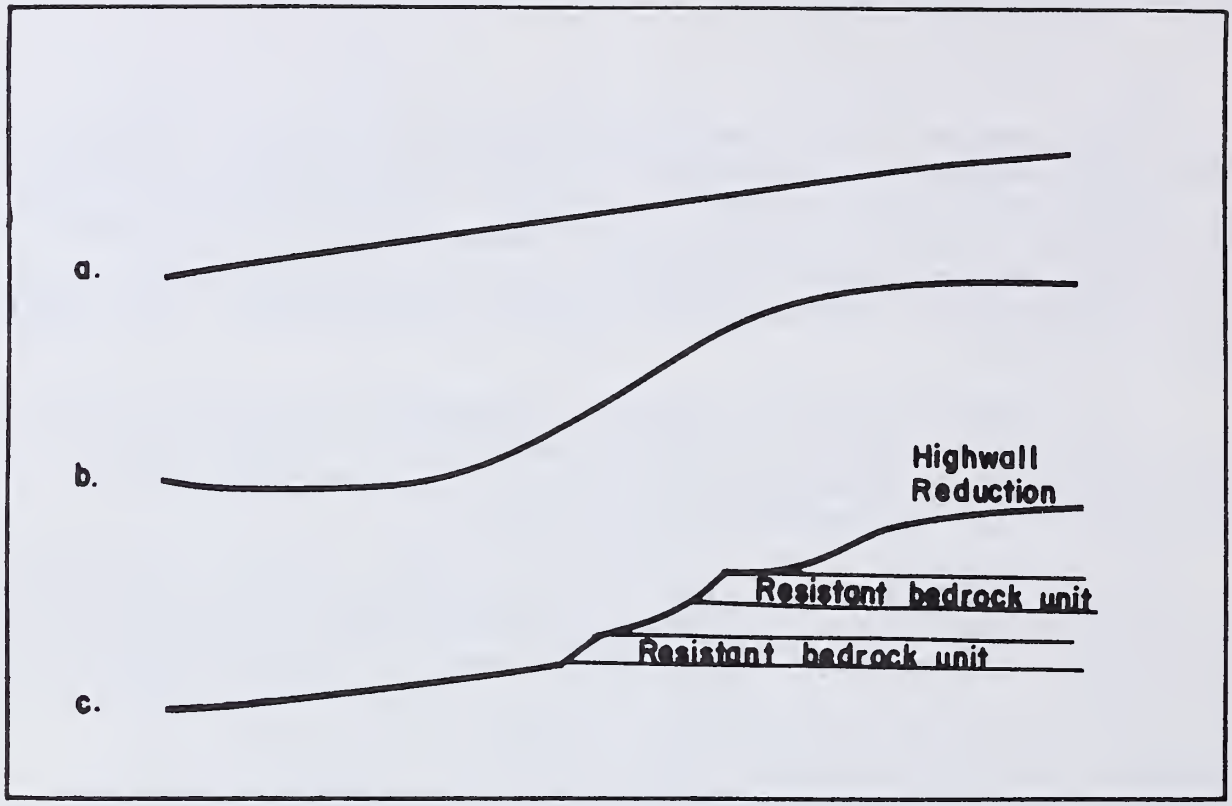

FIGURE IV-1.--Alternative slope profile design (vertical scale exaggerated). Curve a: long straight slopes proposed by WECO. Curves b, c: complex slopes designed to reduce erosion.

d. Transportation

Commuter traffic due to mining at Colstrip could be decreased by introducing car pooling or bus service between Forsyth and Colstrip, and by establishing more temporary and permanent housing at Colstrip. These alternatives would help reduce traffic on the highways connecting the Rosebud mines and outside communities.

Increasing the number of cars in each unit train (from the current 100-120 to 160-180) could slightly reduce resulting air pollution; the the increased emissions from each train's locomotives would probably be more than compensated by the reduced frequency of trains. Extra long trains might not be feasible due to increased wear on track, engines, and cars.

CHAPTER V

CONSULTATION AND COORDINATION

A. DEVELOPMENT OF THIS STATEMENT

Information used to analyze Western Energy Company's proposed permit amendment for Area B was solicited from the following agencies and companies:

Federal Agencies:

Advisory Council on Historic Preservation, Washington, D.C.
Department of Commerce:
  National Oceanic and Atmospheric Administration, Great Falls, Montana
U.S. Department of the Interior:
  Geological Survey, Denver, Colorado
  Mine Safety and Health Administration, Arlington, Virginia
  Office of Surface Mining, Denver, Colorado

State Agencies:

Department of Community Affairs
Department of Health and Environmental Sciences:
  Air Quality Bureau
Department of Highways
Department of Fish, Wildlife, and Parks
Montana Historical Society:
  Historic Preservation Office
Montana State University, Mine Reclamation Research

Companies:

Ecological Consulting Service
Montana Power Company
Western Energy Company

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The Department appreciates the assistance of Mike Shea, permit coordinator for Western Energy Company, who provided the EIS team with information and arranged visits to the minesite.

B. REVIEW OF THIS STATEMENT

A preliminary version of this EIS was reviewed by the Department of State Land's Reclamation Division, the Department's Environmental Administrator, and the Commissioner of State Lands.

In accordance with the Department's regulations governing environmental impact statements (EIS's), copies of this draft EIS will be made available to the public for comments and suggestions. All comments received will be carefully considered in the preparation of a final EIS. Written comments should be addressed to the Department of State Lands, Capitol Station, Helena, MT 59601.

The draft EIS is available for review in the following places:

- Montana Department of State Lands, 1625 11th Avenue, Helena, Montana
- Big Horn County Public Library, 419 North Custer Ave., Hardin, Mont.
- Miles City Public Library, 1 South 10th, Miles City, Mont.
- The Rosebud County Library, 201 North 9th Ave., Forsyth, Mont.
- Parmley Billings Public Library, 510 North Broadway, Billings, Mont.
- Sheridan County Fulmer Public Library, 320 North Brooks, Sheridan, Wyoming.

A limited number of copies are available on request from the Department of State Lands, Capitol Station, Helena, MT 59601.

CHAPTER VI

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